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# United States Naval Institute Proceedings

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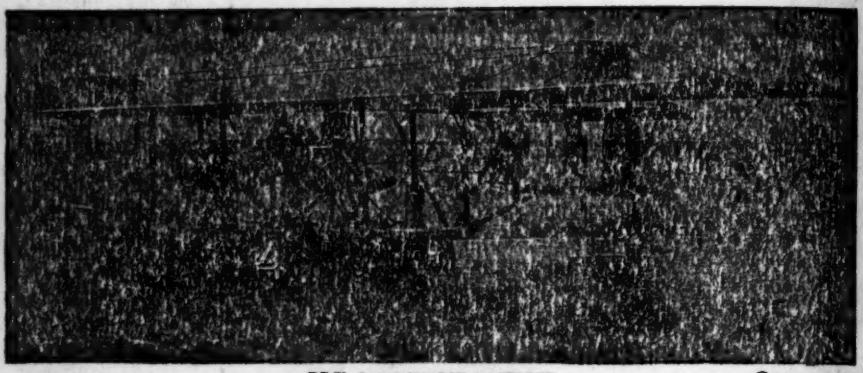

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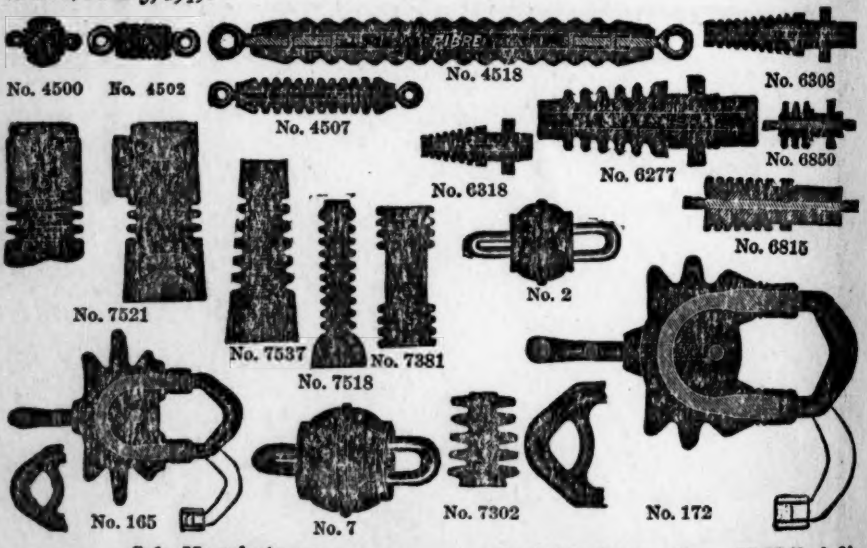


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# UNITED STATES NAVAL INSTITUTE
## PROCEEDINGS

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

## THE FUNCTIONS OF THE OFFICE OF NAVAL OPERATIONS

By COMMANDER A. F. CARTER, U. S. Navy

A great many officers in the naval service have devoted years of serious thought and study to the question of a planning and operating body for the navy. I believe that on one thing they all agree, and that is, the necessity for a central planning body, whether you call it a general staff, or whether you give it some name, which, perhaps, would not sound quite so military, and which would, therefore, be less liable to excite unfavorable comment. After the army general staff became operative and even before that date, our growing navy felt more and more the need of a body whose function it would be to study policies, prepare plans, and operate the forces of the navy. Immediately after the Spanish American war, the obvious necessity for such a body was responsible for the establishment of the general board. As the years went on, and as the navy grew, it became more and more apparent that the general board, while it performed a very useful work and one which could ill be spared at that time, nevertheless failed to answer all the requirements because it concerned itself only with studies of policy and the preparation of war plans. Something in more intimate touch with the working end of the navy was needed—an office combining the planning function with the power to execute the plan, once it was formally approved. The object of the "Something," as it was conceived, was not to divest the civilian heads of the navy of their proper and legal authority,

REMARKABLE AIRPLANE VIEW OF THE U. S. NEW MEXICO, FLAGSHIP OF THE PACIFIC FLEET, DECEMBER 16, 1919. From Underwood & Underwood, N. Y.

but rather to provide them with an expert instrument by which they would be enabled to render a better return to the taxpayer on his (the taxpayer's) naval investment. Year after year the people of the country were putting more and more money into this investment, and thinking individuals, in and out of the service, believed that a law should be enacted whereby a naval officer of proper training and experience should be made legally responsible for the efficient operation of the forces of the navy. The navy, to a very decided degree, is indebted to the Honorable Richmond P. Hobson for his vision in this particular, and for the establishment, by the act of March 3, 1915, of the Office of Naval Operations. At the time the office was established, the principal thing known about it was merely its legal requirements in very general terms. The rapid expansion of the navy, preparatory to precautionary measures which the country demanded after the beginning of the European war, and later preparatory to our own active participation in the war against the central empires, made it necessary to place the Office of Naval Operations on an operating basis before the situation regarding its eventual requirements was actually appreciated by any in authority, perhaps, except the chief of Naval Operations himself.

Before going further, consider for one moment the statutory requirements of the Navy Department prior to the enactment of the law instituting the Office of Naval Operations. The activities of the department are of two general classes: First, the purely naval (sometimes termed the "military") activities; and second, the civil activities necessary to a proper administration of the naval establishment.

Under the first of these the bureaus of the department attend to their administrative duties, and incidental to the personnel functions of the Bureau of Navigation, according to the law as it previously stood, that bureau handled matters relating to the movements of ships and generally, the functions performed at present by the Office of Naval Operations in so far as they were performed.

The second covers generally, the activities incident to the employment and administration of labor, the handling of civil activities of the department, and in the various naval districts and industrial establishments. The policies governing these and the decisions rendered thereon are handled by the assistant secretary.

It is apparent then that we had a Secretary of the Navy and Assistant Secretary of the Navy who approved the policies, and two bodies to make those policies effective. The first of these may be collectively classed as the bureaus; and the second, as the civil activities, all of which come under the cognizance of the Office of the Assistant Secretary.

The " Aid " system later instituted was the first step toward the establishment of the Office of Naval Operations.

It is a well-known fact, which experience has demonstrated in every form of efficient business, both private or governmental, that certain principles must be adhered to if success is to be attained. In the first place it is necessary to *anticipate* the needs of any business and to plan ahead on its requirements for a given future period. Success crowns the efforts of certain corporations because they have brains doing their planning, and because those brains are able to anticipate the needs of the corporation, to lay the work out well ahead, and to acquaint those responsible for administrative details with exactly what will be required of them at a given known future time. Subordinates are then expected to be familiar with the policy and to carry out the plan adopted. The same principle holds with the navy. In order that this business of ours may be efficiently administered, it is necessary for those responsible for the administration to be given the benefit of well conceived plans, the details of which have been worked out, and in sufficient time to enable them (the administrators) to lay out their work well in advance. These then become the functions of operations:

*First, to study the policies of the government; and basing its work upon approved policies, to prepare the plans for the operation of the forces of the navy.*

*Second, to operate the forces of the navy in accordance with approved plans.*

The functions being thus stated, immediately we must determine what authority Congress has given the office in order that its function may be realized. For the success of any project, great or small, certain essentials are admitted. In general terms these are:

First, to determine what is wanted and how it will be attained—the estimate and the plan.

Second, to provide the necessaries to make the plan effective—the material, *and* the personnel; and

Third, these provided, to put the plan into effect—operation of the force provided.

The law governing this office gives to the Office of Naval Operations the duty of planning; it provides for the proper material functions of the office, and it gives to the office the duty of operating the naval forces. It is, however, significantly and unfortunately silent with regard to personnel.

In addition to its other divisions *there should be,* and to fully meet its requirements, there *must* be, a *division of personnel*—not a division to take up the details incident to personnel administration, orders to individual officers and men, their records, etc.; but a division to study the personnel requirements of the service, and the service requirements of the personnel. This work has been handled in a masterly manner by the able administrators in the Bureau of Navigation; but it is no more properly a part of that bureau's duties than estimating upon the number of battleships required to meet a certain foreign policy is the function of the material bureaus.

In order to perform the planning function mentioned above, there has been created in the Office of Naval Operations a planning division. The planning division has two duties; first, the preparation of war plans as required by statute, and second, the preparation of administrative plans in connection with current work. The head of this division is the Director of Plans, a rear admiral, and it is divided into the following sections:

Policy Section.
Strategy Section.
Tactic Section.
Logistic Section.
Educational Section.
Aviation Section.
Administrative Plans Section.

According to the regulations of the Office of Naval Operations, the planning division has no administrative duties except those necessary in obtaining such information from other departments as may be considered advisable to intelligently handle the duties assigned it. The first five sections mentioned above are charged with the responsibility for war plans, while the other sections, although associated with the war plans work, are more intimately concerned with current administrative plans. A discussion of the

necessity for a submarine and an aviation section will be entered into in a separate paper.

Experience has taught us that even for administrative plans (that is, plans necessary for current work) to proceed smoothly, it is not advisable to depend entirely upon those charged with administrative duties in the other divisions. By a gradual evolutionary process there has been constituted an "Administrative Plans Section" in the planning division. The intention of the Chief of Naval Operations is that in this section there shall be one or more senior captains of ripe experience and mature judgment, one of whom will be on all administrative planning committees. The function of the section is really to co-ordinate the efforts of the division of the office, and to insure all planning committee recommendations being in accord with established policies. To illustrate, take the following example: Suppose it has been decided that on account of the personnel situation a certain number of vessels must be placed in reserve or out of commission. The Chief of Naval Operations, or Assistant Chief of Naval Operations makes out a memorandum giving the decision, and stating the case. A planning committee is named to study the question, and offer a definite detailed solution. The committee would probably be composed of a captain from the planning division, an officer from operating forces familiar with the disposition and duties of all ships, an officer from material familiar with the condition of ships affected, an officer from navigation invited to serve on the committee, and an officer from any other division of operations or any bureau which by reason of any circumstances might be interested in the recommendations. In this way, well considered plans are replacing recommendations, frequently immature, which previously were made by first one division and then another, often too (and quite naturally) without presenting fully the requirements from the viewpoint of some other interested division. The recommendations of all such committees and the action thereon are circulated among all concerned, and a copy placed on file for future reference. This procedure will gradually establish precedents based upon accurate records which will simplify and assist future administrators in the Office of Naval Operations.

Although the law is just as exacting in its requirements for the planning function of operations as for the operating function, the former has not as yet reached a full development. On account of the great shortage of regular officers during the war, the Chief

of Naval Operations kept on duty in his office only the absolute minimum of regular officers necessary to carry on the work. That the work could have been more effectively carried on with the assistance of a fully developed and organized planning division there is no doubt, but to get the officers desired for this work meant breaking into organizations already sorely pressed for men of experience. The Chief of Naval Operations therefore decided that for the time being he would attempt to carry on both functions with his administrative force. It was difficult, but every condition facing him was difficult. It meant physical breakdowns, perhaps, and it meant no recreation for anyone connected with the office in a responsible position; but considering the needs of the service at the time, and in order to carry out plans already approved, it was considered best. Happily the war ended before any great amount of damage was done. One valuable officer lost his life from overwork, and there were a number of temporary physical breakdowns. It has all served, however, to indicate the practical necessity for a properly organized and indoctrinated planning division. Such a division is now in the making and should prove of great value to the department.

The other divisions of the office are as follows:

Division of Operating Forces.
Intelligence Division.
Communication Division.
Matériel Division.
Naval Districts Division.
Inspections Division.
Gunnery Exercises and Engineering Performances Division.
Files and Record Division.

When the war began the office was not closely co-ordinated. As its primary function is that of co-ordinating the work of the bureaus and the naval forces, it was essential to bind its several divisions into a closer unit—to make a team of them. This effort has to a great extent been successful, but there is a great amount yet to be accomplished. The greatest handicap to early development in the office itself was the physical separation caused by lack of suitable quarters for the Navy Department. In the State, War and Navy Building with the Chief of Naval Operations were the activities which now comprise Operating Forces and Matériel. The intelligence division (Office of Naval Intelligence) was in another building, the communication division (Director of Naval

Communications) was over at Radio, Va., Gunnery Exercises was in a nearby building, and the inspection division (Board of Inspection and Survey) was half a mile away down Pennsylvania Avenue. Gradually each unit of the team has come to appreciate more and more its relation to the other units, and although the office is much larger now than it was before the war, it is running along more smoothly every day, and performing its useful functions.

The duty of the several divisions of Operations mentioned above is to handle the matters referred to them by the bureaus in such manner that the bureaus (and others concerned) may get a comprehensive idea of the approved policy on the subject, all information obtainable thereon which may be within the province of operations, and a decision together with authority to proceed along certain definite lines. The administrative details belong strictly to the bureaus, and any tendency on the part of any division of operations to delve into such details indicates a lack of knowledge of his business on the part of the offending officer. Navy Department cognizance is a study and perhaps at times a puzzle, but the logical line of demarcation between the functions of operations and of the bureaus and offices of the department is sufficiently clear to insure smooth operation, *provided* those concerned in operations and in the bureaus appreciate their proper function, and do not encroach upon the other. It must be remembered that:

*The function of the bureaus is purely administrative,* whereas, that of operations is, so far as the bureaus are concerned, largely one of planning, obtaining decision, and keeping others informed.

It is unnecessary to detail here the duties of each of the divisions. These are given in detail in the organization orders of the Office of Naval Operations, and a copy of these with a diagram may be obtained upon request.

For many officers in the navy it would be a comparatively easy matter to write an order for the organization and administration of the Office of Naval Operations. The order would have merit because it would doubtless be based upon sound principles of organization which are fairly well known in the service. To one unfamiliar with the conditions under which the present organization of operations has grown up, it probably would contain many features which, from a purely academic discussion of the question, appear most desirable, if not essential. The chances are, however,

that it would not work unless it were written with a thorough knowledge of local Navy Department conditions. Operations is an innovation, and the Navy Department with its train of official procedure for every class of question and paper frowns upon innovations, no matter how necessary they may be. In order to reach the present state of organization there have been many difficulties to overcome. The Office of Naval Operations to-day falls far short of what naval officers would like to see it; but it is established, and its practical value has been so thoroughly demonstrated that any idea of abandoning it would meet with general disapproval out of the navy as well as in the navy. In the humble opinion of the writer, the navy owes a debt of gratitude to Admiral W. S. Benson for the patience, tact, untiring energy, devotion to a fixed ideal, and loyalty to the best interests of the navy which have resulted in the firm establishment of this organization.

There are many problems yet to be solved with regard to the Office of Naval Operations, and to do so will require the cooperation of all officers of the navy, line and staff alike. It is not a line officer's office alone, nor is it interested only in the duties pertaining to the line. In addition to its operating function, it is the planning center for the Naval Establishment. It needs (and doubtless will soon have) constructors and paymasters on its planning work. It needs the support, the sympathy and the active assistance of the entire service. If the navy is to be anything more than a "hit or miss" proposition, if there are to be fixed naval policies, and a source from which information can be obtained and study made to assist in determining these policies, then the Office of Naval Operations must continue, must become more stable, and must broaden in its proper sphere.

In the navy as midshipmen and as junior officers our elders always hammered into us the necessity of planning our work if we expected our efforts with gun crews, with our deck duties, and with our other activities to result successfully. How can we reasonably expect the great machine of the navy to succeed and render a proper return to the honest taxpaying citizen if we do not apply the same principle to the navy. The Office of Naval Operations is the embodiment of that principle, and if wisely administered will enable us as responsible servants of the government to "Plan our work"; and then the more wisely: "Work our plan."

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

# "AVIATION" OR "NAVAL AVIATION"; WHICH?

By COMMANDER D. E. CUMMINGS, U. S. Navy

The proposal to combine the air forces of the army, navy, and other departments of the government under one directing and operating organization seems very tempting. It seems, in theory, to offer the advantages inherent in unity of command, combined resources, concentration of effort, and to offer to all the benefit of the experience and experimentation of each. This tempting program is reenforced by certain war experiences, such as that of the Northern Bombing Group, in which army and navy together, using the same equipment and same methods, worked for the same objective and a single organization was logical and practicable. The British practice of using land machines for fleet work also furthers it. This combination of theory and circumstances is so plausible and convincing that it is necessary, in analyzing it, to proceed with caution, in order to get down to fundamentals and to get away from even the appearance of corps jealousy.

Perhaps it would be well, before considering them in connection with this particular subject, to examine into the intrinsic value and true meaning of the theoretical elements above mentioned.

(a) *Unity of Command.*—It is a fundamental principle of warfare—as indeed of industry—that unity of command is essential to efficient active progress. This means, however, that the forces operating in a given area, for a given objective, should be united under one command; but in practice it also means that large units within that command should be given their particular objectives, and that the control by the high command which co-ordinates the large units should be as general as possible. The army uses aircraft, the navy uses aircraft, other departments use aircraft. Their common working medium is air. Why not combine them

under one organization? A Ford machinist uses lathes, a Waltham machinist uses lathes, a navy yard machinist uses lathes. They all work the same kind of materials, using the same kind of tools. Why not combine them under one organization? The General Electric Company at Lynn and the General Electric Company at Schenectady use the same tools, make the same class of product, for the same owners, but their organizations are distinct and separate throughout. They co-operate cordially. Why not combine them into a single organization? The answer to the first question is, of course, obvious. Their product and the problems connected with it are unlike. The answer to the second is not so obvious. As with many other companies, they find that separate organizations pay better—they produce more efficiently. Perhaps this is due partly to the fact that responsibility throughout the organization—which, axiomatically, must be accompanied by the corresponding authority—is more direct and more personal. The impersonal attitude toward which government organization—and all very large organization—tends invariably—has certain advantages, but also certain disadvantages which are a curse. Certainly this more efficient production gained by separate organization is in some degree due to the specialization of the Lynn organization, for example, on certain special parts of the company's general specialty; and on their working in certain special fields within the general field of electrical equipment; and certain special labor markets and industrial conditions that are best handled locally.

(b) *Combined Resources.*—At a certain stage of the last campaign in France units of the U. S. Army were brigaded with the various armies of our Allies on the fighting line. This was heralded far and wide as a great achievement; and it was. History fails to record another successful similar combination. And as soon as it could be done it was changed in France. It was not changed primarily because the men involved were foreign—the foreign legion drew from every nation—our own army spoke forty or more different languages. It was not done because either impugned the methods or motives of the other, or doubted the efficiency of the other. It was done because of national pride and because the detailed methods, the ingrown habits of thought and conduct, the understanding of one another necessary to the most efficient action could not exist in the two organizations—they could

not combine except under the stress of an immediate emergency. Now, naval aviation is an element of the fleet. The fact has been lost sight of during this war, due to its special and unusual character and to certain temporary conditions, that naval aviation is an auxiliary to the fleet. Its effective development demands a personnel indoctrinated in fleet ideas and ideals; its operation demands an acceptance and a trained knowledge of fleet tactics, fleet methods, fleet objectives, fleet operations. It takes a regular naval officer his entire life specializing in strictly naval work to be thoroughly conversant with the naval profession—if he ever becomes so. A fleet aviator must be first of all a naval officer—aviation is a specialty within the profession, not outside it. The whole effort of aviation in the fleet now (and it is rapidly being recognized in its true light) is to further that idea. Aviation operations during the war were utilized by the naval and military forces for purposes that were determined by the state of development of the art and by their usefulness as adjuncts to the forces on land and sea. They were largely used as individual initiative prescribed, and, at least at sea, their primary usefulness was not demonstrated. All their operations, important—yes, indispensable—as they were, were of a character that is recognized as strictly secondary from a naval viewpoint. At that, the limit of their usefulness has by no means been reached. But their primary function, that of actual tactical use in fleet action has not been recognized generally. The utilization of the functions of spotting, action maneuvers, naval reconnaissance, and bombing (not as regards their technic so much as regards the correct use of those desirable accomplishments) are matters that require the trained knowledge of a naval officer. This war has demonstrated that it is easy to make pilots. It has also demonstrated that it is hard to make naval officers in the full sense of the word—though it is easy to give commissions to men whose talents can be very usefully employed within the limits of their various individual qualifications, which do not include the higher branches of the naval art. Logically, then, the development of naval aviation demands that officers who already have the foundation of the naval profession as such get into and govern the development of fleet aviation doctrine and training, employing technical and outside agencies or officers for aviation from civil life if it proves desirable, but always under a control that is strictly naval in its esprit, its doctrine, its education, and

its understanding. It is perfectly feasible for a directing agency, whether naval, industrial, educational, anything, to utilize to gain its ends various agencies, some of which may have no conception of the end for which they are working; but the reverse is not true. The dog can wag the tail, but the tail can't wag the dog. The principal element in naval aviation is the naval element, and nobody can do it but the navy. In the present state of the art the aviation problems as such are not the difficult ones to solve. They must be quite subordinated to the naval end.

(c) *Concentration of Effort.*—Recognizing that the primary function of the military and naval aviation services to-day—and to-morrow—is to develop the military or the naval uses of aircraft, and, as a necessary but secondary function, to develop the material to fit those developed uses (as the methods of employment are radically different, the material must vary), it is evident that the agency which handles this material must be one which does not direct, but which serves the operating service; the Bible was quite right in stating that "No man can serve two masters; for either he will hate the one and serve the other; or else he will hold to the one, and despise the other."

(d) "The utilization by all of the experience and experiments of each" is an end that is desirable in every trade and profession and field of endeavor; and is met in each of them in various ways, chief of which are trade journals and professional associations and conventions.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

# NAVAL AVIATION

By CAPTAIN T. T. CRAVEN, U. S. Navy

In discussing naval aviation, it is first necessary to have clearly in view what has been assumed as the rôle for this new and interesting development. The mission of that service is taken to be the development of a high efficiency in personnel and in material for co-operation with ships in naval work, on our own, on an enemy's coast, or on the high seas.

The soundness of any conclusions which we may adopt as the result of our study will depend upon a careful analysis of past experience, and proper deductions therefrom which are consistent with present conditions, and have regard for the probable development of the latest instruments of warfare.

Discussion concerning arms and their application is often without satisfactory outcome because of differences in the pictures and conceptions of the phases of warfare, retained in the minds of those indulging in the argument. It would seem logical therefore, before outlining views as to naval aviation, which cannot be considered independently of the fleet at this time, to indicate in a general way the ideas which have governed in reaching conclusions as to the part aviation is to play in connection with naval work.

As a sequel to wars, after test of military and naval materials and methods has become practicable, we find changes in thought have come. Sometimes these changes have been ill-advised and the tactical and material innovations introduced have not stood the acid tests imposed by the passage of time.

It is unnecessary here to point out the far reaching effects of the Russian explosive shell on the Turkish fleet at Sinope, of the Austrian ram at Lissa; of the resisting power of armor as shown in Hampton Roads, or that the results of the fire of the interme-

diate gun at Santiago were at once reflected in naval design as was also the power of large calibers at Tsu Shima. In the terrific struggle just terminated, new arms and novel methods of employing arms have been forcefully developed, and with these we are now particularly concerned. For the mariner the submarine, as a mighty agent of sea power, has definitely asserted itself, and the medium of the air has been first utilized for warlike purposes.

One notes in scanning the pages so absorbingly interesting to a naval officer that practically all of the great naval conflicts which history records have taken place near land. Naval battles have been waged as natural though sometimes eccentric features of campaigns and with the view of furtherance of governmental policies. Usually the conduct of what we most frequently term military or land operations has been intimately associated with maritime encounters and in them the aggressive side has been able to assume and to keep the initiative, usually because of his superior strength the application of which oftentimes has been made possible by better information and superior intelligence.

In glancing back through naval history, we see that actions between large fleets have been infrequent phases of naval warfare. Where forces have felt themselves nearly equal and the stakes at issue have been very important there has always been disinclination to engage.

Great naval battles generally have been fought when one side considered itself the superior of the other either in material or moral force—through surprise or a combination of circumstances, the other was forced to flight. History is replete with accounts of such engagements. As examples we may cite the British victory at Trafalgar, the defeat of the Spanish fleet in 1898, and of the Russian armada in 1904. Rodney's celebrated action in the West Indies and the battles of Aboukir and of Lissa also may be placed in this same category.

One is impressed in perusing the frank and interesting book written by Admiral Jellicoe, in which he clearly records his thoughts, that these views still obtain. Under the British command in the recent war was the mightiest naval force ever assembled. The superiority in material strength of this armada was unquestioned and yet when the day came there was apprehension that the surface fleet of the enemy, composed of vessels which were visible, was perhaps being employed as a bait to lure

the more powerful British force into a trap prepared for its destruction, and the idea was present that the British fleet was too valuable, in view of its responsibility, to be risked unduly.

The naval man is inclined to base his reasoning upon great fleet engagements of what may be termed the classic variety. Perhaps these to him present problems involving fewer variables and unknown quantities than is the case with other operations of sea warfare and the tedious and supremely important matters which have had to do with the bringing together of the antagonists in force. He is prone perhaps to overlook the fact that active naval wars may be conducted without such holocausts taking place. One may ask why and how is such possible, and it is well at this point to examine briefly the circumstances covering the past five years of operations in western European waters. We must not lose sight, however, of the peculiar conditions there existing. Geographically, the opposing forces were separated by very narrow seas. Visibility, always a matter of supreme importance to the sailor, was normally extremely poor. The water was usually discolored and contained much debris which materially assisted the submarine in its stealthy effort. We had during this conflict the British fleet, reinforced by allied units, superior in material strength, facing an inferior power, the German fleet, which presented a constant threat to the Allies. The German Navy was always an active menace because it contained elements of great strength and mobility. Supplied with the intelligence upon which to act, its power to do damage was enormous. These facts loomed up in front of the eyes of the world and were understood by all thinking men. To gain the information which permitted the application of an immense and mobile force was the problem of one antagonist—to obtain the knowledge necessary to counter this effort to surprise was of supreme importance for his opponent. No means were overlooked. The submarine assumed a most useful rôle formerly not conceded to it, that of a scout. Light, fast vessels were recognized as of paramount worth. A wonderful system of espionage was inaugurated and finally the air became accepted as a medium of value for the procuring of information.

The prestige of sea power was vastly enhanced through the results of the war. We have seen the German battle fleet penned up in harbor. For awhile, because of an ability to assure itself reasonable freedom from molestation on the part of its adversary

it was able to make sorties, and so to preserve morale and sea spirit. In this work the assistance of the German air service was invaluable. When the ties were tightened, however, and the German ships were denied the sea, their discipline and morale, shaken by the affair at Jutland, crumbled just as has been the case with all fleets of all periods of history when confined for long in port.

In our studies we note the importance of the mine, the torpedo and the bomb conveyed by fast surface, sub-surface vessels and by aircraft. During the war just ended these destructive agents were of the gravest concern to the antagonists. They have now all taken on definite rôles which, in the future, will make all naval operations conducted on the coast of an aggressive enemy exceedingly interesting for an invader or for one who wishes to carry the battle into the waters of his adversary. It seems evident that these formidable weapons will force the conflicts between big ships, if such are to occur in the future, into the wider waters of the ocean. It also appears that these deadly tools have definitely enhanced the value of that always important characteristic, speed, and the importance of small units of light draught which can best operate in coastal waters.

The procurement of information, together with mobility and speed, appear to supply the keys with which to unlock the doors that open to success in the conduct of military and naval affairs now that the power of the machinery with which to do damage is so tremendous, the types and numbers involved are so great, and the areas over which operations are conducted is so vast.

To sum up, during this conflict, we have seen the heavy battleships with their numerous crews spending months anxiously awaiting a call for service. We have participated in an exceedingly active naval campaign carried on by what might be considered as secondary units. In it the inferior naval power has made a strong fight and one which promised success primarily by reason of the efforts of its forces on land and the ability to secure information. Finally, we have seen the air develop as the medium through which information could most readily and surely be procured. In the light of recent events, is it not safe to predict, that while slow battleships will be retained in navies for the present, no one will wish to invest heavily in them in the future? Possibly they may soon become obsolescent. The importance of

having information will constantly increase and, as mobility at sea improves, the side which possesses superiority in speed and the better intelligence will always enjoy the advantages accompanying an ability to select and to seize opportunities as they are presented.

Speed affords a measure of protection against the torpedo, speed also permits an ability to alter the range and the change of range for the gun, which indicates a crying need for improvement in the power to hit with artillery. In the past fifteen years the initial velocity of our main batteries has increased more than a thousand feet per second. It is submitted in passing that a continuation of the effort to increase the muzzle velocity and so to flatten the trajectory is of supreme importance for the armament of great ships.

Does it not appear that the capital ship of the future will be of the battle cruiser type? Supplied with intelligence, speed will enable that class of vessel to carry great concentrated power into action or to evade battle with a superior force. With guns of high power their ability to do damage is enormous.

Now to end our preliminary argument—as aircraft furnish a means for making a naval force numerically the smaller useful in that they may procure information permitting a swift but heavily armed force to act intelligently; also since aircraft may assist to give to a larger force the knowledge which would make absolute the suppression of a weaker naval body, do we not see clearly the growing value of this arm? In our consideration, however, we must not lose sight of the influence of wind, water and visibility upon actions. Bad weather has usually been taken as an ally by the force seeking to surprise his antagonist or to escape him.

There was a time when being weather wise was important for the sailor in peaceful cruising as well as during hostilities. Of late years we have been able to ignore the weather to a considerable degree in moving our great ships about on blue water and possibly the importance of always having a regard for the elements as a factor in war may wane in the eyes of those who fail to keep before them the practical side of war-like enterprises.

Naturally, nature's limitations, always affecting military and naval operations, will always be supreme in the medium of the air. The aerographer now has become a most important member of society and it is not hard to see that he is destined to have a

far wider range of activity in the future than has been conceded to him in the past. In this country we have not yet begun to put into operation the machinery necessary for scientifically observing and forecasting for the upper air—or for collecting data and communicating the results of observation and forecasts.

So far we have touched only upon the importance of having information; the removal of the bandages from the eyes of a man before he is called upon to fight.

With our slight practical knowledge of the art one would be bold indeed at this time to set forth methods and to advise exactly as to how to carry out our desires. Brief thought, however, will make evident that many of our ideas with regard to scouting are subject to change. Daylight and dark zones for surface vessels may be very much upset by the swift moving air scout, just as the development of the listening device for surface craft may modify our procedures for that class in fog and darkness.

For operations in the clear weather of the West Indies and of the Pacific the value of the rigid dirigible as a scout seems evident and one must regret our failure to appreciate the importance of these great vessels and deplore the fact that, before this, we have not undertaken their construction. Abroad the tendency is apparent to drop the small dirigible which was most valuable in coastal convoy and patrol operations and which can be quickly produced in case of need. While retaining a few of this smaller class for instruction and experimentation, the purpose seems evident everywhere to develop larger and more useful units. This practice appears logical and wise. The big rigid with its wide radius, high ceiling and great lift is indeed formidable and the production of helium gas will vastly increase the safety and value of this class of vessel.

In the consideration of heavier-than-air types, we must have careful regard for the details of the work which it is desired to accomplish. At present we have the difficult task of designing a machine for flying over the water which will be air-worthy when in the medium intended for it and also moderately sea-worthy when once it has landed upon the surface of the sea. Weight, speed, ability to climb and air performance generally must necessarily be sacrificed to some extent in the development of the boat which is the present form of the hull of the seaplane. The difficulties of getting off the water in any other than smooth condi-

tions are well understood. The recent voyage of the NC planes has been a triumph for the advocate of the large boat, and it is reasonable to suppose that the construction of hulls in boat form will continue. It is also logical to infer that improvement in the reliability of machinery will tend to increase constantly the airworthiness of this class. Where wide radius of action is desirable there will always be use for large seaplanes of the NC type. With tenders supplying quarters for personnel, and shop and repair facilities, bases for their purposes may be moved and established anywhere. With such tenders available the necessity for now building and maintaining many permanent and costly bases along our shores, for naval purposes, would diminish. Through these vessels mobility, a first attribute of modern military and naval force, would be secured and by means of them the problem of putting aviation with the fleet or in regions where operations are to be conducted is simplified.

It is not necessary to point out to the sailor that in order to be useful for scouting it is essential that the aircraft know its position. The trans-atlantic flight gave valuable results in so far as navigation was concerned. It was shown that the hazy appearance of the sea horizon when viewed from an altitude, the tremendous effect of the wind, and the rapidity of travel necessitated the development of an artificial horizon sextant, a drift indicator, and short methods of making astronomical calculations in order to permit oversea navigation in the air. The instruments and methods which were successfully improvised for the trans-atlantic flight, are now being improved.

But a short time ago, a considerable run over a flat, even surface was necessary in order to permit a machine taking the air. To-day we see light planes able to jump from the turrets or decks of a ship. We also have as a possible development the ability of these machines to return to and light on decks prepared for their reception. These recent improvements, which have been very rapid, indicate the practicability of further advances, and they have enhanced the value and established the utility of flying machines for ship's purposes. There are those who have faith in the catapult, the uses of which have not been fully exploited. This machine may enable larger and heavier craft to be launched from ships.

The utility of aircraft as scouts has been already explained, but we now see them given other important rôles. From high in the

heavens the observer can keep a constant watch for the stealthy submarine which may be expected to take a prominent part in naval actions of the future. He has been employed as a guide to direct the movements of the submarine. He can also look for the mine or for the torpedo when once the latter has left its tube in pursuit of the target at which it has been directed. He is able to overlook a smoke screen created for the purpose of embarrassing the adversary. A spotter in an aircraft is in a commanding position for observing the fall of projectiles fired from the guns of water borne vessels and in a duel between ships, in bombardment, or in opening a fleet action there can be no doubt of the importance of aviation for the control of gun fire.

The usefulness of the aircraft for the purposes enumerated above is hampered materially by difficulty of communicating promptly and surely. Within the last few years, however, we have seen the radio telephone and telegraph both develop to a wonderful degree, and we may confidently expect that in the near future, science will give us far greater surety in our communications.

In a mêlée at present the advantages of the kite balloon as a post of observation, clear of the interferences incidental to gun fire, are definite. For this craft, positive and direct communications are assured. Towing them about and keeping these unwieldy balloons in service are to-day looked upon as serious embarrassments by the personnel of surface vessels.

Of the offensive power and the tactics of fighting planes accompanying ships, one can say but little to confirm or to disprove what may be already in the mind and the imagination of the reader. If the battle of the future is to be of the classic order of the past, may we not expect, as a preliminary phase, an aerial encounter between aircraft? Possibly defeat in the air may result in the capital ships of one side being assailed by planes designed to suppress the anti-aircraft defenses of the other and those planes being followed by low-flying heavily loaded bombers and torpedo carriers driving home the assault and in a very serious manner, interfering with the formation, the plans, and the efforts of the side so assaulted.

As the chemist has pushed his way into the fighting line, it may not be out of place to mention that the bomb supplies a ready vehicle for the transportation of gas. There is also plenty of room

for a quantity of gas compound within the walls or wind cap of a long-nosed shell.

The gas specialist of the army considers the effective radius of his shell as far greater and more destructive to life than is that of the simple explosive projectile. We are told that he claims a fume that will stick to a moving ship for some time. What is to be the result upon the design of openings such as turret gun and sight ports, conning-tower slits and of ventilator, and forced draft systems, and what effect will the wearing of gas masks have upon the rate and accuracy of fire?

For the attack upon fortified bases and the bombardment of ports aviation has created a means which, it appears, will nullify the efforts of a passive system of coast defense such as that of our coast artillery.

A close blockade of a neighborhood in which many airplanes are based would seem impracticable. A landing operation on any large scale and the establishment of a base would be fraughted with extreme difficulty were these efforts actively opposed by aircraft.

A navy is called upon, during what are termed the normal times of peace, to land parties to suppress disorder and to enforce the policies of peace in turbulent countries. Here again we have an important use for naval aviation. Through the use of aircraft, reconnaissance is possible and landing operations may be covered.

It is manifestly improper to presume that aviation, at the present time, furnishes a panacea for all of the many evils which may be showered upon us by the enemy. There can be no doubt, however, that despite their limitations, the airplane, the dirigible and the kite balloon have all assumed definite and important rôles in the arena of battle. The suggestion is ventured that in connection with maneuvers and academic studies based on the capping of battle columns of capital ships that serious complications have been introduced into the naval game, and, while exercises along the old line are of importance, it appears necessary now to work out what may be called the *complete* tactics of a naval force. To ensure success, one must be stronger than his opponent in every department. The problem of coordinating all of the many factors now involved in naval war is big with interest. Victory awaits him who can best control and coordinate all of his weapons, and reliance on certain types and instruments to the exclusion of others may be disastrous.

The Wright brothers believed that their inventions were important in that the development of the art of flying would make war impossible. This idea may or may not be correct. It would seem certain, however, that the prediction of Admiral Fiske will be verified and it may be stated with every confidence that in years to come the effects of air power upon history will be as interesting to the historian as, in the past, have been the supreme influences of sea power.

Though we in this country were pioneers in aviation, the great stimulus which accompanied intensive utilization of the air from the very start of the war just ended soon left the United States far in the rear in all matters having to do with flying. When called upon to take a part in the conflict we at once awakened to the bitter realization of our deficiencies, not only in so far as the design and production of machines was concerned but also regarding methods of employment. Such a condition was a humiliation to those who, concerned with aviation, had struggled hard to make the subject one of live interest to the legislators on whom there is dependence for funds and to the older officers of the navy upon whom reliance for support is essential. It is unnecessary at this time to enumerate our defects and deficiencies.

We know now that European nations have created organizations as well as an interest which will insure on their part further immediate and rapid progress in the mastery of the air. The problem for the United States is how to organize, not to follow, but to retain a place abreast of the leaders in a field open to all and which offers great, indeed unlimited, possibilities.

On one side we hear the low voice of old conservatism warning against steps which may be faulty, and against undue confidence when moving in a new, and little understood domain. The tone is the same as that which history records as protesting against the use of metal as a material for the construction of the hulls of warships, and the abolition of lofty spars and sails as an auxiliary if not a primary means for the propulsion of these vessels.

On the other hand we hear the shrill, sharp notes of youthful progress. Filled with enthusiasm and optimism, the aviator of to-day sees in his rôle the solution of almost all the vexatious problems of war.

Besides these we also have the subtle, powerful and not always wise influences of politics and of industrialism confronting us.

Opportunity for extravagance and for the uneconomical expenditure of public funds without adequate return is present.

Needless to state, the road over which common sense is to lead is filled with pitfalls and our path must be carefully chosen. The navy should look seriously into the subject of aviation at this time. Knowledge of the art is widely spread and is by no means confined to the service as has been information regarding other naval activities in the past. Unless it can be clearly shown that we are organized to move promptly to a position abreast of the leader in so far as naval aviation is concerned, and to hold a station there, the navy may expect to have to defend its attitude before a well informed and keenly interested public with regard to the use of the wonderful art now available for our purposes. The British Navy lost its aviation branch because of diffidence and disinclination to accept new conditions and innovations which had forced themselves to the front. The same arguments which produced a united air service in Great Britain are now being utilized by those wishing to establish a similar organization in the United States, despite the wide differences that exist in the forms of government and the military methods of the two nations. A united air service of the kind proposed perhaps would best foster the development of flying and the production of machines, but the creation of a new department would certainly entail many new expenses to be borne by the taxpayer and would be unwise until ideas regarding the military employment of the aviation arm are far better crystallized than is the case at present. An independent aeronautic service would surely result in a serious sacrifice of war efficiency because of the added complications incidental to the coordination of the present military and naval organizations with that of a new force having cognizance in the air. Of the difficulties and of the importance of absolute coordination of arms in time of war, the producer, who is the strongest exponent of the united service, can have no knowledge.

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# TIDES AND TIDAL CURRENTS IN BAYS

By COMMANDER JOHN P. JACKSON, U. S. Navy

The phenomenon of a strong flood or ebb current continuing to run sometimes for hours after high or low water is apt to be puzzling at first sight unless the physical reasons therefor are analyzed and understood.

The phenomenon occurs in large bodies of water connected with the sea by comparatively narrow entrances. The action of the tide at such entrances and upon such bodies of water is as follows: On a rising tide, the level of the sea rises and water banks up at the entrance, because its volume cannot flow through the narrow channel fast enough to keep the level of the water inside up to that outside. The entrance acts as a partial dam.

When it is high water along this part of the coast the level of the water outside the entrance is still higher than it is inside the bay since it has continued to bank up faster than it can flow into the bay through the narrow entrance. There is therefore a strong flood current running through the entrance to equalize this, although the high water mark has been reached outside.

The tide outside now turns and begins to flow ebb, but it does not flow away fast enough to bring down the level of the mass of water at the entrance instantly. There is a considerable head of water which keeps a strong flood tide running into the bay, although outside the entrance the tide has begun to fall.

The mass of water at the entrance gradually sinks, flowing in each direction—out to sea and into the bay—until the level of the water in the bay has reached that outside. This may not be until several hours after highwater outside, during which period the current through the entrance has been flowing constantly flood.

If the body of water is long and narrow, like Chesapeake and Delaware Bays, the same impediment to the rapid equalization of the level of the water throughout the bay, which takes place at the entrance, is apparent all the way up to the head. The water gradually attains the same level all the way up, but does so by the continuation of the flood current long after high water at the entrance.

As the mass of water at the entrance slowly subsides, the level of the water inside the bay close to the entrance is eventually brought up to that outside. But this leveling has not yet extended to the upper reaches of the bay. It gradually does so progressively from the entrance to the head. The action may be considered as that of a wall of water or tidal wave starting at the entrance and sweeping up the entire length of the bay. In reality there is seldom an actual wall of water, but a uniform and imperceptibly decreasing level from entrance to head.

Finally, when the level of the water at the head of the bay has reached that at the entrance, the further subsiding of the tide outside brings the level of the sea lower than that of the bay. The tidal current in the entrance then turns ebb. This lowering of the level is gradually felt all the way up the bay, progressively changing the flow of the current from flood to ebb until the head of the bay is reached.

The flow of the flood current near the head of the bay is thus seen to continue until high water at the head of the bay, which it is apparent is several hours after high water at the entrance. The turn of the tidal stream occurs earlier, the nearer the entrance, and coincides with the progress of the wall of water or tidal wave up the bay, as does also high water at each point.

A similar action is now repeated at the entrance as took place on the flood. This time the water banks up inside, trying to escape through a narrow exit to the level of the sea. At low water along the coast outside the entrance, there is still a mass of water which has not yet been able to escape from the bay. The tidal stream outside changes from flood to ebb at low water, but the current in the entrance continues to flow ebb, until the rising sea meets the lowering level of the bay, which may be several hours after low water outside.

To sum up, all of the water which banks up outside a bay with a narrow entrance is never able to get in before the subsiding of

the water outside draws part of it away. High tide in the bay is therefore never as high as that outside the entrance. Similarly all the water which banks up inside the entrance during the ebb, cannot get out before the rising tide outside overcomes its level and sweeps it back.

The range of the tide in such a bay is therefore never as great as on the coast outside its mouth, and this range decreases toward the head of the bay. The flood and ebb currents may be running at their maximum strength in the bay, especially at the entrance, at exactly the time of high and low water on the coast outside. High water and low water occur later the further from the entrance, and the turn of the tide occurs nearer the time of high and low water, until at the head of the bay it takes place at approximately the same time.

The tidal effects are seldom as simple as described above, but are very much complicated by the configuration of the shores of the bay, especially as regards constrictions similar to that at a narrow entrance, the width of and bends in the channels, the number and form of the shoals in the bay, character of the bottom, force and direction of winds, etc.

The friction of the water over a rough bottom, and over shoals, may cause the water to heap up, until sufficient head has accumulated to cause the water to rush up in the form of an actual wave, known as a "bore." The "bore" may reach the head of the bay and be reflected back, causing two points and times of high water with slack water in between. In such cases the duration of the flood and ebb streams may not be at all equal, the flood lasting possibly but two or three hours, and the current running ebb during the remaining period of the tidal cycle.

Furthermore, the direction of the tidal currents may not follow the direction of the channel, but possibly in places flow at right angles to it, as when large indentations and arms of the bay have to be filled and emptied. The direction of the tidal stream may thus be rotary, flowing in different directions at each stage of the flood and ebb. Also eddies are formed on each side of the channel, in bights and behind shoals, which flow in exactly the opposite direction to the tidal stream.

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# THE YANKEE MINING SQUADRON

OR

# LAYING THE NORTH SEA MINE BARRAGE

By CAPTAIN REGINALD R. BELKNAP, U. S. Navy
The Squadron Commander

(CONCLUDED)

## CHAPTER SIXTEEN

### THE THIRTEENTH EXCURSION

The thirteenth minefield was to be partly in Area A, extending from its southeast corner across Area C towards Udsire Island, ending at a point three miles short of a minefield which the Norwegians had planted around Udsire. All mines were of the upper level, and, as the depth varied from 70 to 150 fathoms, three kinds of anchors were used, which necessitated special care as to the order in which mines were stowed in the ships. The purpose of this field was to close the gap between the British and American minefields in Area C, and the American minefields in Area A, and also to increase the surface obstruction across Area C by two more lines of upper level mines.

No duty could surpass this series of mining excursions for interest sustained to the end. The few events and noteworthy features so far mentioned may perhaps seem to conflict with this statement, but the smoothness of operation constantly striven for tended to eliminate interior incidents, and no mere description can ever impart an adequate impression of our experiences. Keen anticipation, attention ever alert, and a sense of adventure were fresh on each occasion. There was sameness enough in the occupations while in port—coaling, cleaning, embarking mines, and liberty in small towns, but life underway meant something doing all the time which every one felt worth while. Until back at the buoy again, inward bound, it was all activity, the hours often crowded, the whole period sleepless for those in command, never dull for any one. Only as the anchors went down and the

tension relaxed could one realize how fast we were living. To quote a *Saranac* poet—

> "They gave us a job we had to do,
> A little bit risky—yes—that's true;
> A good deal like work, both night and day
> But a darn good game for a man to play."

From the earliest discussion of the Northern Barrage project, one of its probable developments was, by general acceptance, to draw out the German fleet, and that ever present possibility gave an added spice to the work. Someone characterized our operations as "An important military offensive with a front seat at the second battle of Jutland," and at the time of the thirteenth excursion it seemed as if the mine squadron might indeed be the bait. Due to the prospect of the German fleet coming out, the squadron was ready a full week before Admiral Beatty could spare a destroyer escort for us.

The *San Francisco* and six other planters made this excursion, the *Roanoke* and *Canandaigua* being omitted. They had been docking at Newcastle-on-Tyne when the mine embarking was done, and although they returned in time to have joined without altering the loading of the other ships, other considerations, external to our Force, determined that they should not go. With *Vampire*, Captain Godfrey, as escort leader for the tenth time, departure was made from Cromarty buoy at 1.30 p. m., Thursday, 24 October. An earlier departure had been first ordered, but a message from the Grand Fleet held us back a few hours.

A storm warning was out as we sailed, and that night the storm overtook us, continuing with varying intensity all the next day and night. Friday forenoon, H. M. S. *Primrose* pointed out and verified Buoy No. 3, and a lull in the storm gave hope that the mining might be carried out that day; but the wind freshened again before the starting point was reached. The ships rolled deeply with their heavy loads, from 27 to 32 degrees each way, but suffered no damage, and the mine installations stood the severe test very well. Through Friday night the squadron cruised back and forth 15 miles either side of the buoy, as far as adjacent minefields would permit. We could not afford to go far away from the buoy, as the time within which we must complete the task was limited and was now scant. After the first turn about, the destroyers disappeared in the darkness, and it was a

relief to feel that at least they were clear of possible collision. We needed no screen in such weather and could dispense with them for the night. In the morning they were back again, the weather moderated, *Vampire* pointed out the buoy, and we could proceed.

Mining began at 1.27 p. m. and continued according to schedule until two hours after sunset. The sea and swell had died out so quickly that conditions were very good for mining. All went smoothly; 3760 mines were planted, the last 37 miles being over water up to 150 fathoms deep. As the first four vessels completed their strings, they were ordered to cross ahead of the remaining planting vessels and take station on the southern wing, off *San Francisco's* starboard quarter, where they would be clear of the British minefield which lay just to the north of us. Three destroyers with high-speed minesweeps out preceded the line of planting vessels until an hour after dark, 5.30 p. m. They then joined the other destroyers to starboard and southward of us. In darkness, and in silence except for the mine detonations astern from time to time, the *San Francisco, Canonicus,* and *Housatonic,* in line abreast, stood on a half-hour longer, to the end of the mining track, with no vessels to sweep or to screen ahead as we drew near the coast. The coastal mountains of Norway and a searchlight playing on the clouds were sighted at considerable distance, but not distinctly enough at any time to make an identified bearing. Udsire Island was dimly sighted in the direction expected, but it was too dark to obtain a definite fix, as its light was not burning. On our left was a field of British mines, eight miles away by the chart, but of uncertain distance in fact, since storms and the coastal current might have moved some of the mines in the ten weeks since they were planted, or broken some adrift. The ships kept on to within three miles, by the chart, of the Norwegian minefield ahead—presumably in place and the mines presumably safe if broken adrift. One lacks, however, the same confidence in other people's mines and minefields as in one's own, and more than the usual relief was felt when our schedule was finished.

Then, promptly, all ships and destroyers turned right 90 degrees, again turning right, five minutes later, 70 degrees more, to course W. by S. The squadron then formed in two columns and, when seven miles clear of the minefield, ran parallel to it on the reverse of the mining course, for observation. A curious effect was

experienced here, the first occasion where we were heading generally toward a freshly laid field, instead of directly away. The vessel's movement through the water towards the mines enhanced the sharpness of shock from the exploding defective ones—to such an extent that both officers and men came on the bridge in real concern, reporting that we must have struck something.

It was noteworthy during this thirteenth excursion that the management of the ships, always good before, continued so, in spite of the heavy weather. About 9.00 p. m. following a hard squall which came in the midst of a turn, causing the ships to get considerably out of station, three successive 90-degree turns were made and the squadron was then formed, upon signal, in a new order, for more convenience during the rest of the night. All was done in good time, yet without any vessels coming uncomfortably near in the course of it. Next day, the last two hours of mining were after sunset, but no lights were shown nor tactical signal made. All maneuvers at the finish were made at prescribed clock times, in obedience to signals sent before dark.

The supporting force sighted us about 1.55 p. m. Friday, 12 miles off, then stood to the westward. About 9.30 a. m. Saturday a light cruiser of the support communicated and at 2.00 p. m. the whole support was sighted again, to the southward, consisting of the second battle cruiser squadron, the fifth battle squadron, and the seventh light cruiser squadron. Vice Admiral Pakenham, in H. M. S. *Lion*, commanding the Battle Cruiser Force, was in command of the whole. This excursion took our squadron farther afield than it had been since June. After the third excursion, all our planting had been done behind a barrier of our own making or else close to British waters, but on this occasion we were on the exposed side of the whole barrage.

Late Sunday night, 27 October, the squadron returned to port, and by the following Wednesday, 30 October, all nine ships were again loaded, and there they waited, for 12 days of vile weather, ready for another excursion. The one planned would have completed the fourth system, extending northeasterly from the end of the twelfth minefield. But no more mining was necessary, and upon the signing of the armistice, the mines on the launching decks were disembarked from the ships, to give more space for the crews. Preparations were then taken up for returning to the United States.

Of six months in European waters to the date of the armistice, on 33 days the squadron or some of its ships were underway, steaming in the North Sea more than 8400 miles. So far as readiness of the squadron was concerned, the excursions could have been made with greater rapidity—never was an excursion delayed on account of a ship's not being prepared. During the five months of minelaying activity, the intervals between excursions averaged 10 days. The time actually consumed in embarking mines, coaling, and routine overhaul came to less than four days, so that four excursions a month could have been made, but for the delays incident to manufacture and to considerations external to our Force.

## CHAPTER SEVENTEEN

### RESULTS

Altogether there were 13 regular excursions and two special ones by the American squadron, and 11 by the British squadron. In all, 70,117 mines were planted, of which 56,571, or four-fifths, were American. In its 230 miles length, the barrage varied in width from 15 to 35 miles, so that a submarine could not attempt a crossing without being in danger for from one to three hours, or twice as long, if running submerged. The obstruction extended to a depth of 240 feet, except over the eastern section of 50 miles length, where the deepest mines were submerged 125 feet.

In small fields, of a few score or hundreds of mines, laid piecemeal by fixed marks, the mines in adjacent lines are usually "staggered," so as to halve and block the opposite intervals, but in an open-sea minefield of immense area, far beyond sight of any marks and laid at 12 knots speed or faster, no such nicety is possible or necessary. The great Northern Barrage opposed from 6 to 10 lines of mines to a submarine on the surface and three to four lines more at whatever depth the submarine might think he could safely pass. Absolute impassability never was attained nor expected. At the thickest part a submarine had one chance in ten of getting through. The explosion of defective mines had left some thin spots—but who could tell where? Such a minefield is not so much like a Chinese wall as it is like a stretch of rough, treacherous country, whose crossing would always be a desperate venture.

Submarines are known to have crossed the barrier, but they all feared it, and as early as 8 July, 1918, some experienced its deadly effect. From the very circumstances of the barrier's great extent and the absence of observers, the full toll, in damage as well as destruction, may never be known. The official statistics of lost German submarines, compiled March 1, 1919, credit the Northern Barrage with the destruction of four submarines certainly, two more probably, and possibly still two more. An equal number were severely damaged, though not destroyed, and it is considered probable by the British Admiralty that the loss of five other sub-

marines, the cause of which cannot be definitely proven, is accounted for by the Northern Barrage. Thus by reliable records, the toll was 17. Indications during the sweeping up of the barrage tend to confirm this. Besides these, to the squadron's credit, should be added the two submarines reported lost in the North Irish Channel, in the field which consisted of British mines laid by our *Baltimore*.

The summary of Activities of U. S. Naval Forces in European Waters, issued by Admiral Sims, says further:

> There is no doubt that this barrage had a considerable moral effect on the German naval crews, for it is known that several submarines hesitated some time before crossing. Also, reports from German sources are that the barrage caused no small amount of panic in some of the submarine flotillas. It is also probable that the barrage played a part in preventing raids on Allied commerce by fast enemy cruisers.

In thus deterring a sally by enemy cruisers, the barrage aided the mission of the American Battleship Division Six, under Rear Admiral T. S. Rodgers, U. S. N., flagship *Utah*, which was sent over to guard the convoys and was based on Berehaven, Ireland.

One officially reported statement of a German submarine captain said that three submarines, including his own, had been damaged by the barrage but all had reached port. The injury in his case prevented his diving. Other accounts, in the press and from individuals, give some indication of the moral effect produced by this great mine-field, reaching to the German Army and also among civilians.

It would be interesting to know what proportion of the submarines that passed the line of the barrier were harmed by it, but the effect upon the enemy went far beyond such tangible injuries. Every successive case of being damaged yet escaping destruction would increase the moral effect, and magnify the number of losses that would be attributed to the barrage, as other submarines failed to return. Official summaries rate depth charges first, mines next, in importance among the five most effective measures against submarines.

A mark of royal approval was indirectly conferred upon the Mine Force undertaking after only one excursion, in the bestowal upon Rear Admiral Strauss of the honor Knight Commander of St. Michael and St. George, and our operations received mention later by the First Sea Lord of the British Admiralty in his reply

to the congratulatory message of Admiral Sims upon the conclusion of the armistice:

> We recognize with a feeling of gratitude the debt we owe to the United States Navy for its wholehearted support during the past 18 months, not only in the submarine campaign and extensive minelaying programme, but also in sending the Atlantic squadron to reinforce the Grand Fleet . . .

During the four months intervening, the press made occasional brief reference to the effectiveness of the North Sea barrier but, compared to other operations, ours received scant mention. A veil of general silence was deemed necessary for our doings, and the policy of concealing the destruction of submarines stood in the way of even telling our men the few authentic reports we did receive of damage to the enemy from our own work.

One account, widely copied in the British and home press, described the barrier, which we had begun and were still at work upon, as already a fact and a British accomplishment! And when, in October, the story was released in America, the accounts which reached us dwelt mainly upon the parts of the work done on shore. As the Secretary of the Navy put it, the minelaying was done with "no glamour nor romance nor appreciation."

It was not in the character of our officers and men, however, to feel discontent. Thoroughly interested in their work and convinced of its importance, they were satisfied to have it progressing well, and to wait for their part to receive its due.

Admiral Sims expressed his recognition shortly before we sailed from Portland, England, for home. All the commanding officers, many other officers, and 25 men from each minelayer were assembled on board the *San Francisco,* and when the admiral came on board, his flag was broken at the main truck. After brief mention of the large numbers and the many activities of our naval forces in European waters, he said that the Mine Force—

> had done a stunt the like of which had not been done in the world before. After we came into the war we designed a mine, built it, equipped the minelayers, sent them over to this side and planted more mines in less space of time than any nation in the world ever thought of doing before. As to the efficiency of the mine barrier, that is something that has not concerned you so particularly as those who designed it; but fitting out the vessels, learning to handle the mines, planting them, and going through the strenuous work has been really one of the finest accomplishments of the navy on this side. . . . . as a nautical feat, a piece of seamanship, it has been perfectly successful.

Another thing particularly gratifying is that the conduct of the men of the Mine Force at their bases and at sea has been exemplary. I think one thing that has impressed itself on this side more than any other is the conduct of our men. They were inclined to regard us, when we first came over here, as men out of the wilds of America. I think they rather wanted to strengthen their police force when we came around. They found out it was not necessary. Not only have you created a good impression by your conduct as far as seamanship is concerned, but you have created a splendid impression socially. We hear it on all sides. . . . .

I wish you a Merry Christmas and a Happy New Year; and when you get back there you can tell them all about it. You need not feel that you have to tell them you did the whole thing. Just tell them a straight story and you may be more than satisfied with that. . . . .

The Secretary of the Navy's annual report characterizes the Northern Barrage as "the outstanding anti-submarine offensive project of the year," and elsewhere he wrote of it as "a truly wonderful work," the story of it "one of the thrilling contributions of what the navy men did in the war."

Admiral Benson, Chief of Naval Operations, our highest professional authority, considered the achievement of the Mine Force one of the most successful efforts of the whole war by any of the forces engaged. Not only has the North Sea barrage had a deterring effect necessarily on the enemy, but it has convinced the European nations that there is no task which the United States once undertakes to perform that they cannot and will not successfully carry through. I believe that the moral effect alone of the North Sea barrage, not only on the enemy, but on our friends, to say nothing of the excellent training to our own personnel, will be worth more to the country than all the money and time spent upon it.

Actual serious damage to submarines, in amount comparing well with that done by patrol and escort vessels in thrice the period of time, panic among submarine flotillas, probable deterrence of cruiser raids, and considerable moral effect at home and abroad—these results were well worth while. And is it not more than probable that the barrage weighed heavily towards the German collapse? Imperfect though it was—expected to be so in its first consideration—still, there it stood, a deadly menace already, which could and would become more and more effective, the more the submarine campaign was persisted in. That campaign could not hope to survive it.

## CHAPTER EIGHTEEN

### GENERAL LIVING CONDITIONS

No account of the mining excursions would be complete without some description of the conditions in which the ships' companies worked. The accommodations on board were sufficient for their officers and, when clear of mines and the weather such as to permit hatches and air ports to be open, the crew's quarters were roomy and comfortable. Upon embarking mines, however, the crew spaces in all ships except *Shawmut* and *Aroostook* became very cramped, and as the season advanced, mines were on board during a greater part of the time, while rainy weather became more frequent, thus making more discomfort on board with less diversion on shore. The simplest movement below decks was interfered with by the mines; moreover, their presence forbade moving pictures on board, restricted smoking, and limited the "happy hours" and similar forms of diversion, so common in our navy and so particularly desirable in our circumstances.

After the third excursion it became the rule to embark the mines as soon as possible after returning to base. For the one night following a planting, the ships' decks would be clear for hammocks, and all the watch below might then swing on their billets. Occasionally there would be one more night before the mines would be in the way again, but generally most of the ships would begin to take coal or mines on the day following their return to port. Thus the period of rest allowed, after the physical exertion and the tension of a mining excursion, was brief.

Ventilation was always poor at sea, especially in the *Roanoke* and *Quinnebaug* classes. The intended ventilation systems had not been completed, no ship having more than 60 per cent of the designed supply of air and some less than 40 per cent. On the lower mine decks, with steam on the elevator pumps and mine winches, and considerable numbers of men in the track crews, the air became very close, foul, and hot. As the weather grew bad, causing seasickness below, the condition of the lower decks and the air may be imagined, making an extensive cleaning and airing out imperative immediately on reaching port.

All the ships' crews numbered considerably more than originally intended, because extra men were found to be needed and still others were taken, in training for the general naval supply. Notwithstanding the crowding and other unfavorable conditions, partial inspections in the course of the summer and thorough inspections at the close showed that in upkeep and cleanliness—as well as in mining, steaming, signaling, tactical handling, boating, messing, and discipline—the state of affairs in all departments was highly creditable to any type of ship.

The crowded conditions on board, the lack of deck space, and the tense and arduous character of the men's normal work, made diversion on shore more than ordinarily necessary. Thanks to the energy and tact of Commander Canaga and the squadron athletic officer, Lieut. Commander Hewlett, and to the co-operation of the ships' athletic officers, interest in athletics was well sustained, a series of well-played baseball games giving entertainment to the townspeople as well as the men, and doing much to promote friendly relations, as described in an earlier chapter. And thanks are due in large measure to the local residents for their hospitality extended to both officers and men. The opening of the Northern Meetings' building, well equipped, by the American Y. M. C. A., and a large reception by Captain and Mrs. Rowley at Inverness, and a similar initiative by Rear Admiral and Mrs. Pears at Invergordon, gave such things a good start, which carried on throughout our stay.

Inverness being headquarters for the relief of prisoners of war in Germany belonging to the Cameron Highlanders, and Invergordon for the Seaforth Highlanders, our people attended the fairs and sports in considerable numbers, bringing in new life and spirit, as well as swelling the receipts. The bands from our two bases and from the *San Francisco* were in constant demand through all the neighboring country, and exhibition games of baseball made another drawing feature. After the Black Isle fête, at the ancient little town of Fortrose, the manager wrote that the *San Francisco's* band had brought in £27 from the sale of programs alone, and the whole intake was more than double the previous year's.

For the Cameron Highlanders' sports, the Countess of Elgin organized a toy-making competition, offering souvenir prizes. Our men entered into the idea with more interest than expected,

producing many articles of real value, none that did not bring a good price, and helping materially to make the toy stall a great success. Before sailing for home, the men afloat and ashore combined in presenting a fund exceeding $500 to equip a new school playground for the Inverness boys and girls.

When the summer had passed and darkness came on early, dances became frequent, the Scottish lassies quickly learning the American steps. The erstwhile quiet little Queensgate hotel did a rushing business, its ball room being taken, by sailors or officers, six nights in the week. And the men of Base 18, together with amateur talent of Inverness, staged a show, of which Admiral Sims, who saw it in London, said:

> I saw your show, the second part of it, in London the other day. It had anything of its kind I have seen skinned to death. There isn't another one that holds a candle to it. It is particularly gratifying that the show included a number of the young girls of Inverness. The show was clean and refined and splendid in every way. It was a pleasure to go behind the curtain and thank them and to kiss that wee bit of a girl who used to do the dance.

These diversions kept the men in good spirits and up to the mark in their work. They were the more useful because of our comparative isolation and concealment. The best was made of whatever came, with unabated zeal, steady improvement, and cheerfulness always. Despite the high prices of clothing and the excessive wear and tear on uniforms from the mines, the crews kept themselves, as well as their ships, in creditable appearance. Their discipline was excellent, their behavior on shore on all occasions repeatedly evoking favorable comment, both official and private, and their fine spirit showed also in a handsome subscription to the Liberty Loans, the squadron taking of the fourth loan five dollars for each mine in their fields. As a visiting naval officer reported:

> The whole Mine Force is short on criticism and complaints, but long on work and results, and the navy should be intensely proud of them.

## CHAPTER NINETEEN

### FAREWELL TO THE HIGHLANDS

The squadron's task was not finished with the signing of the armistice, for some of the unused mines had to be carried back. Two weeks passed before orders came for home—all kinds of rumors were rife meanwhile, and the wait was the more trying because of the influenza quarantine against amusement resorts. This had its benefit, in that the Mine Force escaped the epidemic almost entirely, but with the season too far advanced and rainy for athletics and the Y. M. C. A. closed, the quarantine bore hard on the men afloat.

So long as the mines were on board, no relaxation of discipline could be permitted, and in order to keep the men well occupied, infantry and rifle practice were added to the ship drills, and formal inspections of ships were begun. The prospect of these inspections always keys things up. All ships did well, but the last one inspected, *Roanoke*, Captain Stearns, surpassed all expectation, being a model—judged by the highest standard—of efficient organization, training, and administration, pervaded by a uniformly high and loyal spirit.

One great test was to rig for getting the mines out in case of fire—though a forlorn hope at best, since 15 minutes (the time in which the mines would explode when exposed to fire) would scarcely suffice to begin discharging. The promise of Commander Beck, *Roanoke's* executive officer, to be ready in 10 minutes was received by his colleagues with derision. When the test came, he stood quietly by, letting his men work without coaching. A flicker of patient resignation came over his face as he saw that some zealot had disabled one of the winches to be used by putting oil on the friction-clutch, because "it looked like bright work." But in spite of the consequent delay, all was ready in only *six* minutes. "I thought I was some little executive myself," said one colleague, "but I've got nothing more to say."

Fortunately the quarantine was raised in time for full enjoyment of our last week in the Highlands. Our friends omitted nothing in hospitality and goodwill. Entertaining on board had

been an extreme rarity during the minelaying, but now it could be permitted, and the squadron had the honor of a visit from The Mackintosh of Mackintosh, chief of Clan Chattan, colonel of the Cameron Highlanders, lord lieutenant of Invernesshire, who had been most hospitable to us. All the captains were assembled on board the *San Francisco* to receive him and afterwards to lunch with him. He inspected the crew and ship with Captain Butler, his first visit to an American man-of-war since 1870 in Gibraltar, on board the old *Kearsarge*. Chancing to ask a man's name, the reply "Scott, sir," made everything after that go smoothly.

On our national Thanksgiving Day, Rear Admiral Clinton-Baker sent a message to Rear Admiral Strauss, which, with the latter's reply, expressed cordial satisfaction in working together and in the mutual regard and respect sprung up, which would help to bring the two great navies into still closer union. A theater party and reception at Invergordon and a formal dinner and ball at Inverness were given that day by British naval officers. The ball was held in the "Northern Meeting" rooms, the annual assembly place of all the Highland nobility and gentry. This was the first dance there since the war began, and it was a most enjoyable affair, picturesque with dress kilts and lively with the Highland fling. Next day the enlisted men were given a ball in the same place, which usually held 700, but on this occasion 1400. Next morning my orderly, Rose, could not wait for me to appear but woke me up to hear, "Commodore, the British treated us *fine!*"

On Saturday, the American officers gave a return ball, which was as well attended as we could desire, and so, at midnight, festivities ended.

Our sailing being set for Sunday midnight, there could be no gatherings at the actual departure, but just before noon Captain Rowley came out to the *San Francisco* with Mrs. Rowley and a small party, to say goodbye, and at Invergordon Rear Admiral Pears went on board the *Roanoke*, to use her radio telephone for his parting message to me. From late that afternoon until midnight the flagship's signal bridge had no respite, farewell messages and replies continuing until we were clear of the harbor. All were the same tenor—appreciation of the work accomplished, "pleasant and friendly memory, goodbye and God speed." The recollections

taken away of beautiful country and kindly people could only make us wish to revisit them.

Among the last signals exchanged with the shore were:

**To: Commander Mine Squadron One:**

**The Commander Mine Force wishes to thank the officers and the men of the Mine Squadron for their efficient work and loyal cooperation and wishes them a happy return to the United States.**

**To: Commander Mine Force:**

**The Squadron Commander in behalf of the captains, officers, and men of Mine Squadron One returns sincere acknowledgment for the Commander Mine Force. Signal of thanks and good wishes. The Squadron is deeply gratified to receive his approbation for its part in his unprecedented undertaking so successfully accomplished.**

## CHAPTER TWENTY

### SCAPA FLOW

The Mine Force was not represented at the surrender of the German fleet, but on our way to Portland, where leave was to be given before sailing for home, we passed through Scapa Flow to see the surrendered ships.

As our long, single column approached the British squadrons lying at anchor, on guard, a signal invited us to steer between their lines, and as we wound in between the battleships and battle cruisers, their crews were assembled on deck—very striking in solidity of mass and evenness of rank and file. They cheered each passing minelayer, our crews running from side to side to make response, the bands playing the national airs, and signals being exchanged.

To: Admiral First Battle Squadron.
From: Commander Mine Squadron One.

Captain Belknap presents his compliments and regrets that his movement orders do not permit paying his respects in person to Admiral Madden. The U. S. Mine Squadron sends congratulations upon the great success that has brought about this unprecedented spectacle. 0919.

From: Admiral Madden.
To: Captain Belknap.

Thank you for your 0919. I wish the Mining Squadron speedy return home and have much regret in parting with such a splendid force.

Then silence was ordered, as we neared the Germans' anchorage. First came the destroyers, to the left, moored in pairs with a few British destroyers at their head, and then, on the west side of Cava Island, the large ships came into view. Many signs of their downfallen state were evident, and the sight was to me the more impressive from having seen that fleet in its ascendancy. Now, in some ships scarcely a man was to be seen, on others the rails were crowded, officers and men mingling together, to gaze on their untouched bait.

In quiet procession we had nearly passed them all, when the British trawlers on the opposite side, holding the net across Hoy Sound—had been holding it in fair weather and foul, for three long years—seeing our flag and knowing what our work had

been, broke out in long and loud blasts of their whistles—having crews too small for an audible cheer. The *San Francisco* responded with the usual three whistle blasts, which the ships following repeated in succession, but one of them blew her siren instead, and that started them all again. For a few moments there was a fearful din, and how this must have struck the British ships, on the other side of Cava, was indicated by the next signals exchanged soon afterwards:

From: Captain Belknap.
To: Admiral Madden.

Many thanks for your kind message. The Mine Squadron has much enjoyed its duty with the Grand Fleet and is much honored by the association.

From: Admiral Madden.
To: Captain Belknap.

Reply.—Thank you. For your hilarious Mining Squadron, a speedy trip home and have much regret in parting with such a brave bunch.

Clearing the island, we passed H. M. S. *Lion,* flagship of Vice Admiral Pakenham, who had commanded the support on our last excursion. The *Lion* was steaming back and forth across the way out, like a sentry on his beat, a ready check on any German ship that might attempt escape.

Replying to my greeting, the *Lion* flashed from Vice Admiral Pakenham:

I greatly regret that only a farewell signal is possible. You take with you not only my personal regards, but the gratitude and admiration of the Battle Cruiser Force and united wishes for a happy return to your country.

As the squadron passed out of the harbor, the garrisons at the entrance turned out and cheered and one of the seaplanes that had patrolled for submarines while the squadron was planting on some of its excursions sailed over and around the *San Francisco,* each time nearer, until he swooped by with a roar and a wave of the hand, so near that his wing tip passed not 20 feet from the bridge.

Three months afterwards came a letter from Vice Admiral Sir William C. Pakenham:

I trust old friends on your side have enjoyed return to their own country, but we miss them much over here. When your Force steamed through Scapa, I thought Providence as well as skill must have been on your side to enable you to pass through a period of such dangerous service, and yet to take all home.

## CHAPTER TWENTY-ONE

### HOME

Until departure from Scotland, the squadron had been almost free from the influenza epidemic prevailing elsewhere so seriously, but during the ten-day stay at Portland some cases appeared among men returning from leave. Among 427 persons on board the *San Francisco*, there were 113 cases before the disease was finally checked. Enough officers and leading men escaped, however, to warrant sailing for home with only one day's delay, but leaving 40 men in Portland hospital. A few mild cases developed on board the other ships, fortunately with no serious outcome.

On Saturday, 14 December, the *Shawmut* and *Aroostook* sailed for the Azores, en route for Bermuda and Hampton Roads, their limited fuel radius making these stops necessary. The rest of the squadron followed on Tuesday, 17 December, taking the direct route. The rule of no homeward-bound pennants for less than two years' absence being relaxed on account of exceptional conditions, all ships on leaving Portland flew long streamers—one so long and large from the *Roanoke*, a steam winch was needed to hoist it.

Immediately encountering bad weather, for three days less than half the desired progress was made, and the *San Francisco* had a serious breakdown of her steering gear. Several men were injured while steering by hand, which had to be discontinued, because the sea drove so heavily on the rudder. The ship was then steered by the screws alone for four days until temporary repairs could be made. Upon the weather clearing, it was decided to divide the squadron, allowing *Roanoke, Canandaigua, Housatonic,* and *Quinnebaug* to continue the direct run, which their remaining coal and daily consumption warranted doing, while the *San Francisco, Canonicus,* and *Saranac,* with shorter fuel supply and larger consumption, proceeded by the Azores.

Like other forces coming home, we wished to come into New York, for a touch of the limelight after being so long in obscurity, and because the location was central for letting the men go home. With mines on board, we could not expect a welcome anywhere,

and at New York bare permission was doubtful—especially so soon after the Perth Amboy explosions. With no prospect of being *invited* there, we sailed with destination announced as New York as the one possible chance of getting there, but orders soon came to steer for Hampton Roads instead.

Near mid-passage on Christmas night, after dinner, a British collier collided with the *Roanoke,* opening a good-sized hole in her port side forward. Supports of the bridge being knocked away, its end sloped down, making it seem at first that the ship was rapidly settling. Steam from a broken pipe came forth in volumes, to which the red glow of the port sidelight lent the appearance of smoke and flames. Collision and fire, with 500 mines on board, far at sea in cold, misty weather, would have been indeed serious. It needed just that to round out our experiences, but fortune was with us, and the situation was promptly brought under control.

The *Quinnebaug* saw the collier safe into Halifax, and then overtook the other three, all four minelayers arriving at Hampton Roads without further incident on 30 December. The *Shawmut* and *Aroostook* had already come in on the 27th. The rest, pursued by bad weather 10 days out of 16, both Christmas and New Year spent at sea, and feeling our way into port through fog, the *San Francisco* and the two with her arrived early January 3, 1919, making the squadron once more complete, except for the *Baltimore,* still absent on experimenting duty.

In due course, the last mine was safely discharged from our ships, making a clear record of over 60,000 mines handled without mishap. And yet we were not to disperse without one more experience—a serious fire. The very night after the *Saranac* had landed her mines, a fire broke out in the wardroom, spreading so rapidly that, until outside help came, it seemed impossible to prevent her being completely gutted. Only great exertions saved her and the incident showed that our strict guard against fire had been no idle precaution.

## CHAPTER TWENTY-TWO

### THE MINE SWEEPERS

With the removal of the mines in peace, the sweepers came into prominence, which gives occasion to mention an inconspicuous part of the Mine Force work, too easily overlooked. There were four large seagoing tugs in the mine squadron, *Patuxent,* Lieutenant J. B. Hupp; *Patapsco,* Lieutenant W. E. Benson; *Sonoma,* Lieutenant J. S. Thayer; and *Ontario,* Lieutenant E. J. Delavy. These, as fleet tenders had towed targets, carried passengers, mail, stores, and the like. All this continued after they were assigned to the original Mine Force, yet, by a more systematic apportionment of their former duties, time was gained for training in mining and sweeping, enough to arouse a keen interest and foster the Mine Force spirit. In the fleet's tactical and strategical exercises the tugs took part, and upon our entering the war, the anti-submarine net tasks and the experimenting that were assigned to the Mine Force were possible of accomplishment only by the use of these tugs, together with our mine carrier vessel, the *Lebanon,* Lieutenant H. N. Huxford. In seaworthiness, power, and equipment, these vessels had what was needed, but their chief value lay in the resourcefulness and energy of their personnel. Lieutenant E. S. R. Brandt, U. S. N., was their division leader, commanding the *Sonoma,* during their first 18 months in the Mine Force.

Night and day, they were always ready, and it seemed as if their power and seaworthiness would take them anywhere. Well equipped for salvaging, they played an important part in saving the U. S. S. *Olympia* and afterwards the *Texas,* when they grounded, in 1917. Often they had long hours of hard duty, but could always be counted on. Service in them gave excellent experience for both officers and men, and many were the capable petty officers turned out. The question "Can you do it?" was never asked, nor "Are you ready?" It was necessary only to say go and do, and whether foggy or clear, the tug that was sent would nose her way through somehow.

These tugs were not properly equipped for mine sweeping, lacking the special type of winch needed for that purpose, but

their 18 months' experience with improvised arrangements yielded information of great value for the new design of a combined sea-going tug and mine-sweeper type, of the *Bird* Class, contracted for during the summer of 1917. By the original plan for the Northern Mine Barrage, the first 12 to be completed of these new sweeping vessels were assigned to the mine squadron, and continued efforts were made to expedite their completion, but without success so far as concerned their joining the mine squadron.

Meantime, in the experiments and tests of the mine, in training the new personnel, and in every kind of transportation and other assistance to the new minelayers during the month preparatory to sailing, the four original tugs were invaluable. The new sweepers not being ready, the original four were fitted out to take part in the work abroad. When the mine squadron left Hampton Roads late in April, 1918, the *Patuxtent* and *Patapsco* were temporarily detached, to proceed by way of Bermuda, the Azores, and Brest, escorting a convoy of submarine chasers across. Rear Admiral Wilson, U. S. N., commended them for being the first to deliver such a convoy intact. They finally arrived at Inverness 24 June, 1918, where they were used to inspect and observe minefields, to communicate between the detachments of minelayers at the two bases, and to train men.

The larger pair, *Sonoma* and *Ontario,* were retained with the minelayers until their final sailing for abroad. The *Sonoma,* Lieutenant J. S. Trayer, accompanied the squadron on its trip across, making a notable passage for a vessel of her size. Always ready for any duty, up to station, and able to steam at maximum speed at the end of a 3000-mile run, she earned commendation for her captain and her engineer officer, Lieutenant L. W. Knight, U. S. N.

With the *Ontario,* which accompanied a convoy of submarine chasers across, the *Sonoma,* after a brief stay in Scotland, went to Queenstown, where the need for that type was greater than with the Mine Force. In this assignment their rescue of submarine victims was a continuation in greater degree of similar pre-war assistance, in home and Cuban ports, off Hatteras and Cape Maysi, rendered to vessels in distress from collision, breakdown, and fire at sea.

## CHAPTER TWENTY-THREE

### THE MINE FORCE, OLD AND NEW

Details of preparation have been only briefly touched upon in the preceding chapters, though actually their influence on the success of the operation deserves more prominence. It will not be supposed that the new squadron just grew, or that in the active operations everything just broke fair. On the contrary, success was earned by logical, consistent preparation, extending back over years and by sound organization and execution when the plan was launched. Hard work, development of doctrine, and prospective study, between 1914 and 1917, bore fruit, and, for the navy's credit, the foresight which produced it deserves record along with the achievement itself.

While suitable and adequate material would ever be the first essential in such an operation, the all-important question lay in the personnel afloat. The excellent qualities of the new mine would be of no avail without proper laying of the barrage. Fortunately we already had a minelaying force, small but capable, so that we did not look abroad for instruction.

Prior to 1914, minelaying from a ship underway had received little attention in our navy, but when some early events of the great European war showed what a part mines were likely to play in the future, mining affairs were made the principal duty of Captain G. R. Marvell in the Navy Department, the conversion of two more minelayers was pushed to completion, and mine training was taken up in earnest in the fleet.

The hitherto solitary mine ship *San Francisco* was taken out of the heterogeneous group known as the Auxiliary Division of our fleet, to become the flagship of a separate organization for mining and mine sweeping, which was established on July 10, 1915, while Admiral F. F. Fletcher had the Atlantic fleet.

In the development of this new branch, which was under my command until September, 1917, one truth came out forcibly, that the sustained attention requisite throughout mining operations could only be insured by keeping everything up in man-of-war style. Laying and recovering mines was messy work, and in a

ship of a type long obsolete, classed as auxiliary, and using a weapon of stealth barely tolerated, to maintain such a standard was not easy. As Sir Eric Geddes, First Lord of the British Admiralty, said in a speech in New York, "Before the war, mine-laying was considered unpleasant work for a naval man, an occupation like that of rat-catching, and not attractive."

Whatever aversion may have been felt quickly vanished in the growing interest that had been aroused. Besides its own specialty, the new branch joined the fleet's tactical, gunnery, and strategic exercises, these last leading to new activities and to study of the possibilities of mines and of the logical functions of the Mine Force. Both Admiral Fletcher and his successor, Admiral H. T. Mayo, did all in their power to establish the new element firmly as a regular part of the mobile fleet. Their interest and encouragement had immediate effect in confirming the personnel's sense of value, which had been engendered by the variety of their employment, the stimulating results of their efforts, and belief in the power of their weapon.

Experimenting with submarine nets was also taken up, and in our first six months of war, the Mine Force was employed chiefly in planting three nets in Chesapeake Bay, and one each in Long Island Sound and at Newport entrance. Success with the Long Island net, over five miles long, was only achieved after a hard struggle with a five-knot current, which time after time swept the net away or, crushing its buoys, pulled it under and entwined it with tons of kelp.

Such in outline was the scope of Mine Force activities during the 28 months prior to preparing for the North Sea expedition. We had not yet laid any minefields during the war, but as if in practice for the very operation to come, the Force, early in December, 1916, had laid a minefield off the Jersey Coast, below Sandy Hook—200 loaded mines, in three parallel lines laid simultaneously, and all taken up by next day—the press not notified. Various arrangements in connection with the handling and transportation of mines had been planned and actually practiced. For result—when the Northern Barrage project came under consideration, the question of practicability of the operation could be answered yes with confidence, and the subsequent working out of mining installations, organization, and training was guided by reliable data—all from our own experience.

Many-sided experience had produced a well-knit organization of units that were resourceful, self-reliant, and mutually helpful, well trained on sound lines in minelaying, singly and together. Long hours and work in all weathers were a matter of course. Quiet self-confidence was the mark of the Force spirit. And thus, although the original Mine Force was much too small for the great task ahead, its value as a nucleus and leaven for the greatly enlarged mine squadron to be formed could hardly be overstated.

Since the autumn of 1916, the principal Mine Force officers had been myself, as Force Commander, Commander H. V. Butler, commanding the flagship *San Francisco* and senior aid, Commander A. W. Marshall, U. S. S. *Baltimore,* and Commander T. L. Johnson, U. S. S. *Dubuque.* All these were to take part in the North Sea operation and were concerned in its preparation—myself in charge, Butler training the new crews, Marshall experimenting with the new mine, which Butler concluded, and Johnson helping to select the new ships, then going abroad for information. Their experience and their ships were invaluable both in preparation and afterwards. On the principle that, let material be old or new, discipline may be the best, the style of these seasoned men-of-war, aiming to match the highest naval standard, was always a strong influence in the squadron.

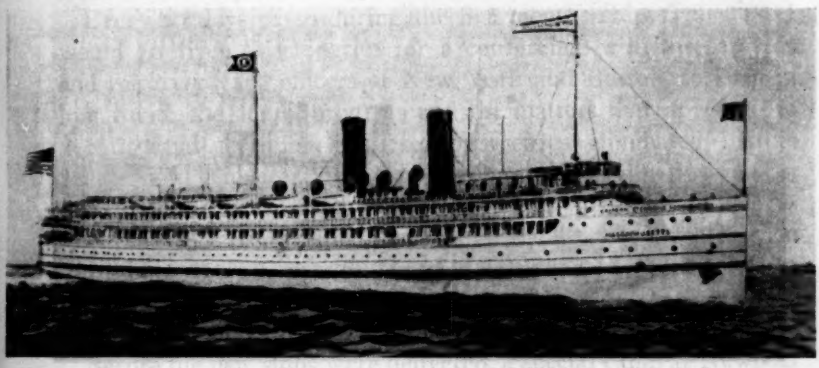
In October, 1917, with the original order to go ahead, which was accompanied by a word of strong approval, from the President down, the development of plans and co-ordination of all preparations became my principal duty in the Office of Naval Operations. Command of a minelayer and two years at the head of mining affairs in the Atlantic fleet had given me experience that was directly pertinent.

The intention being to lay the barrage as soon as possible, and counting five days as the least time between minelaying operations—coaling, embarking mines, out, laying, and back—the expected manufacturing output of 1000 mines a day demanded a minelaying squadron with capacity of 5000 mines at one time. Towards this, our *San Francisco* and *Baltimore* carried together only 350 mines. The eight new vessels would add 5350, thus providing a good margin, either for the loss of a ship or for speeding up.

No time was to be lost. The demand for ships, ship-yard work, and ship equipment for other purposes was increasing every day.

Within 10 days the Eastern Steamship Corporation's fast passenger liners *Massachusetts* and *Bunker Hill,* running daily between New York and Boston, were purchased outright, becoming the *Shawmut* and *Aroostook.* Within a month the Southern Pacific freight steamers *El Rio, El Dia, El Cid,* and *El Siglo* were taken over, becoming *Roanoke, Housatonic, Canonicus,* and *Canandaigua,* respectively. Carrying 860 mines each they soon became known as the Big Four. The Old Dominion steamers *Hamilton* and *Jefferson,* familiar to passengers between New York and Norfolk, followed by December 6, 1917.

The task of making four freight ships habitable for crews of 400 men, at the same time carrying twice as many mines as any

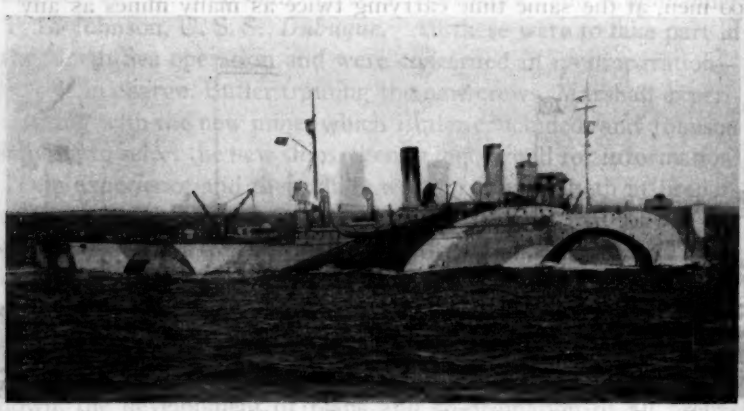


THE BOSTON-NEW YORK PASSENGER LINER "MASSACHUSETTS."
Before conversion into a minelayer.

other vessel of their size, is not done by a wave of the hand, and as for the four passenger steamers taken, they were gutted like fish—saloons and cabins ripped out—before their conversion could begin. Although plans had to be based upon what could be done within a reasonable time, with material and labor scarce, all features had to conform to the requirements of the mining installations. These were almost entirely new on the scale contemplated, either in our own or any other service. There was little data available of similar installations, except some British mining memoranda and a few belated blueprints. Lieutenant DeSalis, R. N., kindly placed his experience at our disposal, which was a help, but attempts abroad had not made a success of mine elevators—which would form a cardinal feature of our installation—

nor had others gone in for mine-carrying capacity to the extent we contemplated—which was the maximum number consistent with not squeezing the crew intolerably. Hence, little of their information proved applicable to our case. Experience in our own minelayers, however, *San Francisco, Baltimore,* and *Dubuque,* during the past three years, enabled many details to be decided with a confidence that subsequent results confirmed.

That winter of 1917-18 will be long remembered! Material was scarce, transportation congested, labor unsettled, fuel short, weather severe, haste and high prices everywhere. Much delay came from lack of interest among workmen. The campaign of



THE 20-KNOT MINELAYER "SHAWMUT."
Formerly the coastwise passenger liner *Massachusetts.*

addresses by good speakers explaining the need for the ships and the men's own interest in doing their best, did not begin until sometime in February, and then only in a small way. There was insufficient supervision, the contractors were converting vessels to a type for which no model existed, and plans were not forthcoming as fast as wanted, often not in the logical order. Besides delays and losses of material in transportation, one trade in which labor was shortest—shipfitter—was the one on whose work much of the other had to wait.

By constant urging and anticipating probable delays, the work as a whole was kept always progressing, even if at times slowly. The captains to be, and their principal officers, came to the ships soon after their taking over, and by January 25, 1918, two of the

largest ships, *Roanoke* and *Housatonic,* were enough advanced to be commissioned. Living conditions were extremely rough amid the dirt and disorder, made worse by the slush and mud in the unpaved shipyards; but the presence of officers and men on board exerted constant forward pressure, while they were becoming acquainted with their ships. In the conversion of the *Shawmut* and *Aroostook* at Boston Navy Yard, the ships' companies worked in industrial gangs alongside the civilian employees, with such actual accomplishment and setting such an example, as to advance the date of completion materially. At the same time, their training progressed so well that, on June 16, 1918, only one week after completion, they started across.

Every 10 days or so during the five months shipyard work, I would go from Washington for a conference with the captains and the navy yard officers at New York and Boston, to keep in touch with the actual progress and the matters that appeared to need special attention. These conferences eliminated infinite writing and enabled closer touch to be kept with all preparations, additional effort to be more appropriately applied, than were possible by regular procedure alone, especially amid the swollen volume of correspondence in general. They developed, too, a good understanding among the officers, which made for future harmony and gained time towards the squadron's readiness.

Before the new ships were delivered, a special camp at Newport had been provided for training their crews under Mine Force officers. The *San Francisco* and *Baltimore* gave some practical instruction on board, and the camp was supplemented elsewhere, so that few, if any, wholly untrained men went to any ship. Three gun crews were trained in the battleships for each minelayer, and the engineer personnel were kept under training at Philadelphia until wanted. For the officers, similar measures were taken to put them in touch with the methods and experience of the Mine Force, as far as this could be done with ships most of the time at shipyards, fitting out.

Unlike the old Mine Force, the new was to consist of organizations on shore as well as afloat, and for this an officer of flag rank was wanted. Rear Admiral Joseph Strauss, U. S. N., was selected as the new Commander of the Mine Force.

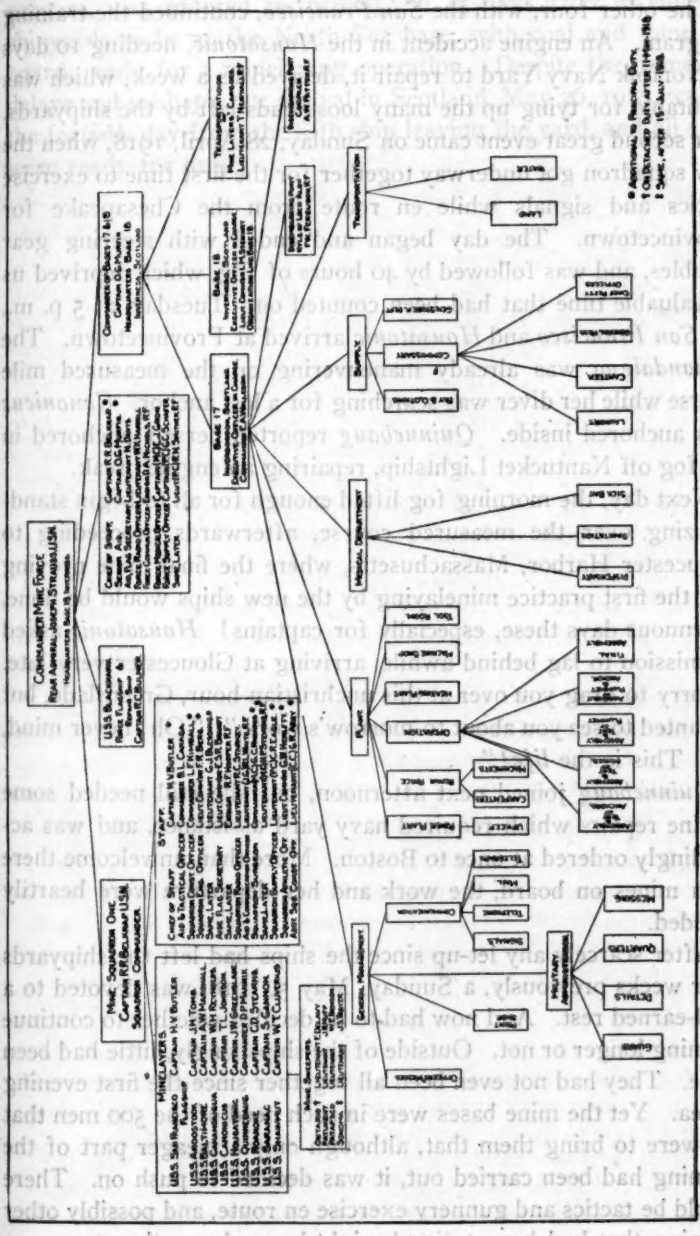
Long identified with ordnance matters and of distinguished experience at the Naval Ordnance Proving Ground and Smokeless

Powder Factory, he was Chief of the Bureau of Ordnance for some years before going to command the U. S. Battleship *Nevada*, which he quitted to take command of the mine operation. On February 15, 1918, he came to temporary duty in the Office of Naval Operations, where he familiarized himself with all information bearing on the operation and its preparation, and after a tour of inspection to the ships and acquainting himself with the mine situation, he sailed for England with his aid, Lieutenant Noel Davis, U. S. N. On March 29, 1918, he assumed command of the Mine Force, with headquarters at U. S. Naval Base 18, Inverness, Scotland. Thereupon the original Mine Force, consisting only of ships, became Mine Squadron One, and it became my part to complete its preparations in the United States and command the active force afloat.

The new Mine Squadron One was organized on Wednesday, April 10, 1918, at Hampton Roads, Virginia, on board the squadron flagship *San Francisco*. I relieved Captain H. V. Butler, U. S. N., who had been in command of the Mine Force in the interval. He remained as captain of the flagship and was also my chief-of-staff—the same association that we had in the old Mine Force. Commander Bruce L. Canaga, U. S. N., who had been my invaluable assistant in Washington since the preparations began in November, came as my senior aid.

To us who had struggled through the long winter's difficulties, it was a memorable event when the first new minelayer, the *Roanoke*, Captain Stearns, joined the flag, on Friday, 12th April, 1918. She was followed closely by the *Housatonic*, Commander Greenslade, and by the *Canandaigua*, Commander Reynolds, next day. All was arranged for their loading with mines, and they began at once. By a week later the *Quinnebaug*, Commander Mannix, and *Canonicus*, Commander Johnson, had joined, completing the number ready for service at that time.

Almost immediately the *Roanoke* was sent across ahead of the others, an inspection only 16 days after leaving the shipyard showing that her excellent condition warranted it. She was to help the *Baltimore*, already there, to finish laying the minefield in the North Irish Channel, described in a previous chapter, but though she arrived in good season and ready, through a change of plan the *Roanoke* was not employed there, proceeding instead to Invergordon.



ORGANIZATION OF THE MINE FORCE.

The other four, with the *San Francisco,* continued the training program. An engine accident in the *Housatonic,* needing 10 days at Norfolk Navy Yard to repair it, delayed us a week, which was profitable for tying up the many loose ends left by the shipyards. Our second great event came on Sunday, 28 April, 1918, when the new squadron got underway together for the first time to exercise tactics and signals while en route from the Chesapeake for Provincetown. The day began and ended with steering gear troubles, and was followed by 40 hours of fog, which deprived us of valuable time that had been counted on. Tuesday, at 5 p. m., the *San Francisco* and *Housatonic* arrived at Provincetown. The *Canandaigua* was already maneuvering on the measured mile course while her diver was searching for a lost anchor. *Canonicus* was anchored inside. *Quinnebaug* reported herself anchored in the fog off Nantucket Lightship, repairing an engine break.

Next day, the morning fog lifted enough for all to begin standardizing over the measured course, afterwards proceeding to Gloucester Harbor, Massachusetts, where the final mine proving and the first practice minelaying by the new ships would be done. Strenuous days these, especially for captains! *Housatonic* asked permission to lag behind awhile, arriving at Gloucester very late. "Sorry to drag you over at this unchristian hour, Greenslade, but I wanted to see you about to-morrow's work." "Oh! never mind, sir. This is the *life!*"

*Quinnebaug* joined next afternoon, but she still needed some engine repairs which required navy yard assistance, and was accordingly ordered at once to Boston. More than unwelcome there with mines on board, the work and her departure were heartily speeded.

After scarcely any let-up since the ships had left the shipyards four weeks previously, a Sunday, May 5, 1918, was devoted to a well-earned rest. And now had to be decided whether to continue training longer or not. Outside of the ships singly, little had been done. They had not even been all together since the first evening at sea. Yet the mine bases were in such need of the 500 men that we were to bring them that, although only a meager part of the training had been carried out, it was decided to push on. There would be tactics and gunnery exercise en route, and possibly other training that had been omitted might be made up then too.

And so the original period of time, estimated as necessary to prepare, was adhered to, namely: in 45 days after leaving the shipyards to be at the North Sea base, with coal and mines on board, ready for a minelaying operation. Despite the numerous delays and mishaps, our arrival in Scotland, May 26, 1918, was on the fortieth day from the fifth ship leaving the yard, and all ships were ready for duty.

## CHAPTER TWENTY-FOUR

### AFTER THE WAR

The war over, the reorganized United States fleet was to include only the *San Francisco, Baltimore, Shawmut,* and *Aroostook* as minelayers. The Big Four ships were to bring troops home, and the *Quinnebaug* and *Saranac* to go back to their owners, the Old Dominion Steamship Company. The *San Francisco* needing repairs, the squadron flag was transferred temporarily to the *Baltimore*. This took place 17 January, 1919, at Newport, Rhode Island, whence we had sailed on our mission eight months before.

Never before in all my experience had I been in an organization where harmony, mutual confidence, good will, and loyalty prevailed so completely as in this Mine Squadron. The high spirit of the officers and men showed in the condition of their ships, their work, their discipline, and their individual personal bearing. To command such a body was an honor that could not be laid down in silence, and so, before the two pioneer minelayers parted, I spoke to their assembled officers and men as follows:

I am speaking to you to-day as representing the Squadron. It is very appropriate that, on this occasion of temporarily transferring the flag, I should get together the officers and crews of the two old war horses, *San Francisco* and *Baltimore,* that have made our success possible. The work in the Northern Mine Barrage did not begin only a year ago. It began for a squadron of mining ships when the *Baltimore* and the *Dubuque* joined the *San Francisco,* in the middle of 1915. These old ships set an example that made the rest aspire to follow, to live up to the high standard and steady pace necessary to accomplish what we have done.

To-day marks the end of the "Yankee Mining Squadron," that did four-fifths of the Northern Mine Barrage. I do not need to tell you how highly mentioned our work has been. When the reports have been published, no doubt it will be highly thought of in this country and by all who read about it in the future. This success is due, not to any one of us, not to any few of us, it is due to all of us. I am very proud to have commanded such a force. It is a deep gratification to have such a success come as a result of the efforts we have made through four years. Naturally, I shall never forget, but I wish to let you know that you should never forget it.

The Squadron is now reorganizing. Some of you may go to other duty, some may go out into civil life, where you will work during the conditions of peace which you helped to bring about. And now let me remind you

of the principles on which we won success in our part in this war and on which we always did our work. Remember this! that the everyday things are the easiest to forget, and it is because we have carefully kept before us the importance of doing the everyday things right that we have earned success. We have not been afraid of work, we have never shied at any job. Every man has felt his part as important to do properly as any other man's part, and as long as the work was to be done he has kept up his attention. That has been the main principle—not to slack down—that a job is not finished until it is done, and it is not done until it is done right. We have not sought the easiest way but the right way, and we have generally found that the right way was the easiest way in the long run. And further, that a job, to be rightly done, must be as good at the end and in the middle as in the beginning. We have not slackened. The 860th mine of the *Canonicus,* of the longest string ever laid, was as good as the first or the 300th or any other mine.

I congratulate you all on the work you have done. It will be a very satisfactory and proud memory for you and for all those connected with it. But I congratulate you most on the preparation that it gives you to do still more, to be better men, to be better citizens. Nothing more valuable could come from our work than that.

You can fancy what my associations are with these two ships. I made my first cruise as a commissioned officer in the *Baltimore;* and the past four years in her and the *San Francisco* have been the most interesting I ever had. I am very sorry to leave you of the *San Francisco* even for a short time, but I could not leave under happier conditions. To leave at a time of a success like this happens only once in a lifetime. Good luck to all of you.

Long before the barrage was finished we were studying how to sweep it up, and soon after the signing of the armistice, experiment began towards safeguarding the sweeping vessels. Before leaving for home the squadron transferred over 400 men to the bases for the sweeping duty, and subsequently a number of new sweepers were sent over from the United States, in groups commanded by officers formerly of the mine squadron.

The British authorities took steps immediately to mark out the barrage area, with light-vessels and gas buoys, and actual sweeping began as early as December, 1918. It will take months to complete, but well inside a year from its laying the Northern Barrage will have become a thing of the past.

It served its purpose, and more besides. Through the part played in former wars, submarine mines grew in recognition, though slowly, as important means of defense. In this war they came into extensive employment in offense, the largest as well as most striking offensive use being the Northern Barrage, which, in popular phrase, put mines on the map.

## SUMMARY OF MINES LAID

| Excursions | 1 | 2 | 3 | 4 | 5 | 5a | 6 | 7 | 7a | 8 | 9[4] | 10 | 11 | 12 | 13 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Canonicus | 763 | 710 | 798 | 810 | 170 | ... | 640 | 810 | ... | 820 | 830 | 860 | 860 | 820 | 890 | 9781 |
| 2. Housatonic | 769 | 800 | 840 | 830 | 320 | ... | ... | 810 | ... | 820 | 830 | 860 | 840 | 820 | 800 | 9399 |
| 3. Canandaigua | 775 | 710 | 760 | 779 | 170 | ... | 640 | 810 | ... | 820 | 830 | 840 | 840 | 855 | ... | 8829 |
| 4. Roanoke | 745 | ... | 830 | 810 | 146 | ... | 640 | 820 | ... | 820 | 840 | 840 | 860 | 855 | ... | 8206 |
| 5. Quinnebaug | ... | ... | 600 | 600 | ... | ... | 610 | 590 | ... | 600 | 600 | 610 | 610 | 615 | 610 | 6045 |
| 6. Saranac | ... | ... | 597 | 580 | ... | ... | ... | ... | ... | 560 | 600 | 610 | 610 | 615 | 610 | 4782 |
| 7. Aroostook | ... | ... | 320 | 320 | 290 | ... | 330 | 310 | 290 | ... | 320 | 330 | 330 | ... | 340 | 3180 |
| 8 Shawmut | ... | ... | 300 | 320 | 150 | ... | ... | 320 | 290[5] | 270 | 320 | 330 | 330 | ... | 340 | 2970 |
| 9. San Francisco (Squadron Flagship) | 153 | ...[1] | 170 | 170 | 170 | 166 | 160 | 170[6] | ... | 170[6] | 170[6] | 170 | 170 | 170 | 170 | 2179 |
| 10. Baltimore | 180 | ... | 180 | 180 | 180 | ... | 180 | 180 | ... | ... | 180 | ... | ... | ... | ... | 1260[2] |
| | 3385 | 2220 | 5395 | 5399 | 1596 | 166 | 3200 | 4820 | 580 | 4880 | 5520 | 5450 | 5450 | 4750 | 3760 | |

Supplied by Base 17 ..... 28,930
Supplied by Base 18 ..... 27,641
Total ..... 56,571

Total U. S. Mines in Northern Barrage .. 56,571
Total laid by U. S. Squadron in the war. 57,470
British mines in Northern Barrage ..... 13,546
Grand Total in Northern Barrage ..... 70,117

Total distance steamed, from the assembly buoy and back ..... 8,383.5 miles
Total hours underway, from the assembly buoy and back ..... 739 hours

[1] Present but not planting.
[2] Plus 899 British mines laid in North Irish Channel.
[3] Excursion by U. S. and British Minelaying Squadrons joined, Rear Admiral Strauss, U. S. N., in command.
[4] Same, Rear Admiral Clinton-Baker, R. N., in command.
[5] Flying the Squadron Commander's broad pennant for the excursion.
[6] Flying the flag of the Commander of the Mine Force for the excursion.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

# ACOUSTIC AIDS TO NAVIGATION

By COMMANDER C. S. McDOWELL, U. S. Navy

It is well known that one of the most serious marine risks is the danger of grounding on charted coasts due to the inability, on account of fog or inclement weather, of obtaining correct position of a vessel. It is a common occurrence to read of some large vessel going aground on the coast during a fog which would have been prevented if bearings could have been obtained of recognized lights. It is the purpose of this paper to show that there is at present available means of obtaining bearings which can be used in all sorts of weather, day or night, with greater ranges than obtained with lights, and that the system permits of equal accuracies in angles as obtained with lights, that the bearings can be obtained as quickly as with lights and, in addition, that the observer can be located in the chart house or practically any other desired location in the ship. This system utilizes sound waves transmitted through the water in place of light waves transmitted through the ether, and as water is practically, for the transmission of sound, a stable medium, the obstacles which prevent air from being satisfactory for transmission of either sound or light, during a fog, are not obtained in the case of sound through water.

There has probably been more learned about "sound" and its transmission during the past four years than during all the rest of time. This was a more or less neglected branch of physics when the war started, but the necessity of locating submarines and big guns incited intensive researches and experiments of "sound" transmission and reception.

The practical results of these researches have many uses for peace purposes, probably one of the greatest being as aids to navigation.

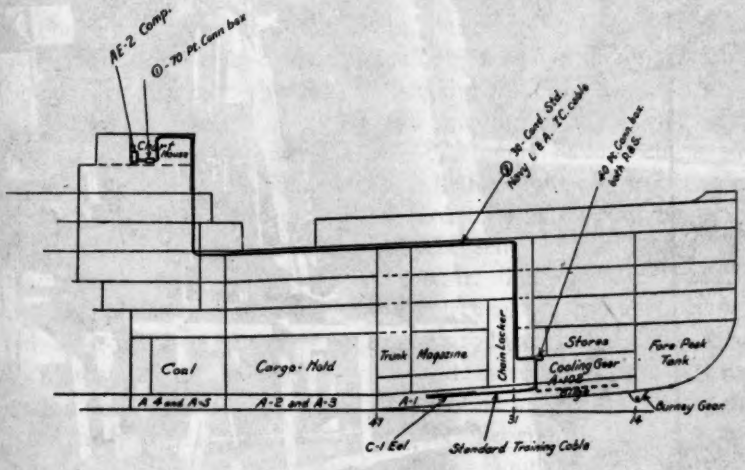
It has been found practical to install listening devices, either outside the ship's skin or within ship's tanks, and hear external sound sources at considerable ranges with the listening ship underway at full speed—not only is it possible to hear and distinguish different sound sources at considerable ranges under these conditions, but also the direction of the sound source can be obtained with an accuracy of within 2 or 3 degrees.

In order to obtain selectiveness and eliminate effect of propeller and other local noises, while underway, it is necessary to use multiple unit devices. These listening units may be mechanical-acoustical with air leads through piping to mechanical compensator, or, the units may be microphones with electric leads to an electric compensator. The question as to which type of unit and compensator should be used would be decided principally by the distance the listening room or booth, with the compensator and observer, is to be installed from the listening device. Both types of apparatus have proven satisfactory in service, and ranges and accuracies of the same order have been obtained with each. With microphones and electric compensators the observer or listener may be located in the chart-room or any other desired location; while with the mechanical-acoustical type the listener and compensator should be located as close as possible to the listening units, so as to eliminate losses and discrepancies due to long air leads. It is probable that in larger ships the electric type would be preferable, while in smaller ships the mechanical-acoustical would be used.

Devices of the above types have been installed on a large number of destroyers and on one or more transports. The mechanical-acoustical type has been generally used on destroyers although at least one installation of microphones and electric compensator has been installed on a destroyer. The mechanical-acoustical development preceded the electric type, so the best type for destroyers may not yet be settled.

An installation of multiple unit microphones with electric compensator was made on the *Von Steuben* the early part of 1919, the microphones in this case were mounted both inside ship's tanks and covered by a blister, like the standard acoustical "MV" installation, outside the ship's hull. Arrangements were made for connecting either series of units to the compensator so that the two mountings might be compared. It will be noted in the diagram that the units in the ship's tank are marked "C-1 Eel,"

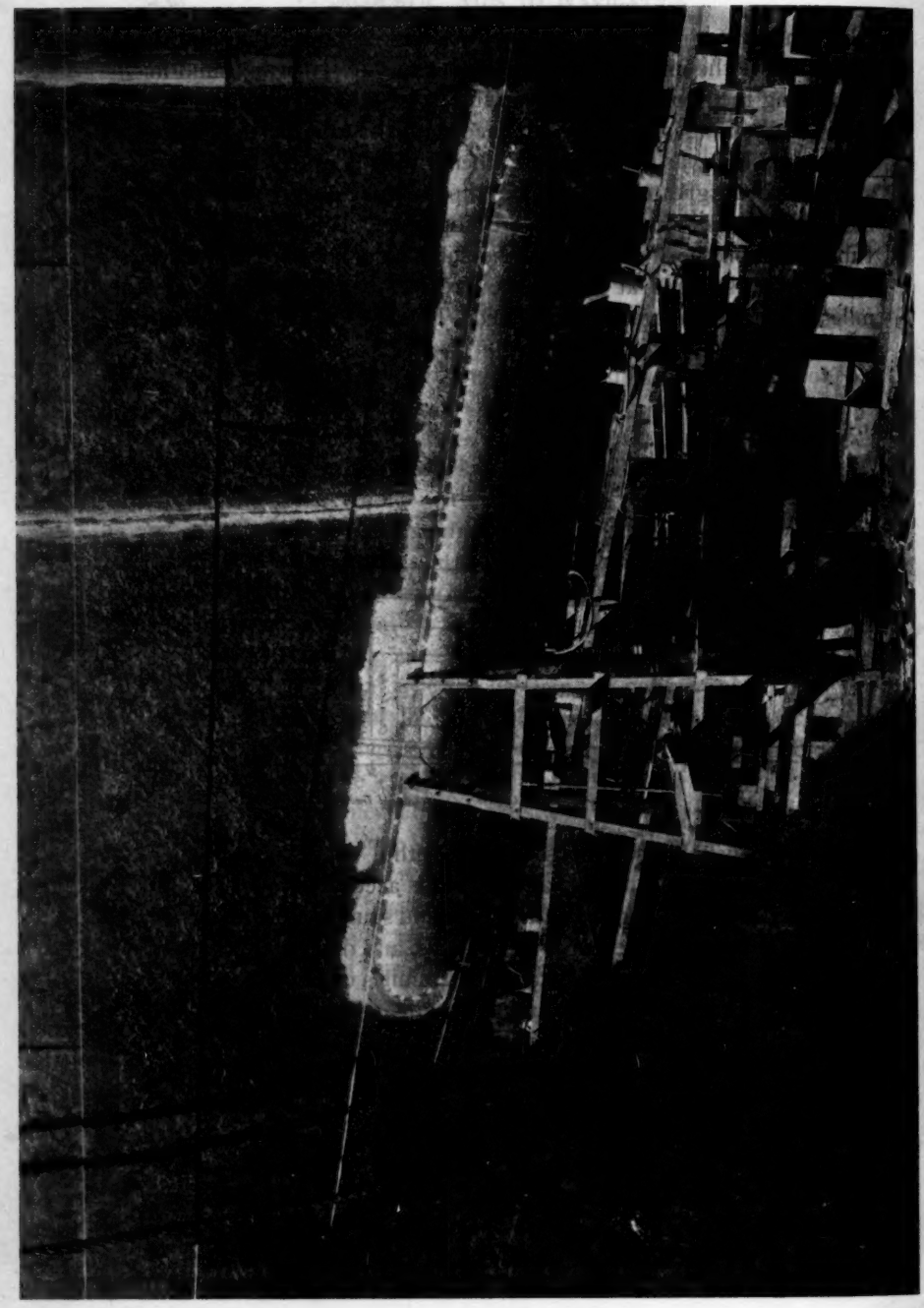
while the blister units are shown by a broken line. The photograph shows the units as installed with a blister. It was found in comparing the two installations on the *Von Steuben* that considerably greater ranges could be obtained with the units in the blister when the ship was stopped and when running up to about half speed, but at greater speeds and up to full speeds, the units mounted in the water-tanks were superior. When running at full speeds on the *Von Steuben* the submarine bell on Nantucket lightship was heard at a distance greater than thirty-five (35) miles and accurate bearings obtained. Leaving New York harbor




there were usually two bells always within range from which bearings could be obtained, and position accurately plotted. It may be safely stated that a distinctive sound source, as a submarine bell or oscillator, can be heard at all times, and during all kinds of weather in deep water at a distance of 20 miles or more.

If the present lighthouses and lightships, or other selected localities, are equipped with distinctive sound sources, a ship's position can be obtained as accurately by sound in a fog as at present by light on a clear night.

In addition to using the listening equipment on a ship to get bearings of distant sound sources, it may be utilized to determine fairly accurately the depth of water. When a ship is running the noise from its own propellers may be centered on the compensator and a bearing obtained; in shallow water this bearing instead of



NAVY YARD, NEW YORK. U. S. S. "VON STEUBEN." INSTALLATION OF BLISTER; ALSO SHOWING BUBNEY GEAR.

being close to 90 will be found to be nearer 180 degrees, being the propeller's noise reflected from the bottom of the sea. In addition, the pitch of the sound changes as the ship runs into shallower water. It has been found that the 100-fathom curve could be fairly accurately picked up in this manner when approaching land and that changes of depth from there in could be fairly well determined.

If the danger of grounding during a fog or overcast weather be eliminated there remains the danger of collision between vessels under such weather conditions.

The same equipment for use in obtaining bearings of fixed sound sources can be used to obtain bearings of other vessels. Some success can be obtained in listening for propeller noises of other vessels and obtaining bearings and thus avoiding collision. Several cases are on record where destroyers have been saved from collision by this method. It is better, however, to provide on each vessel some form of distinctive underwater sound source by means of which fog signals may be sent out with the same frequency as the present fog signals in air. The equipment necessary to provide a satisfactory sound source on a vessel may be any one of a number of forms of sound producer, thus an electric oscillator or submarine bell may be used, or some form of tapper on the propeller shaft or ship's skin may be installed. The form of sound producer used would probably depend on the size and type of vessel on which installed and the amount of sound energy it would be desired to put in the water.

The same fog signals may be sent out under water as are now used in air, but it would be preferable to have these signals show the course and speed of the vessel, and this may readily be done.

With proper underwater sound signal stations along the coasts and with vessels equipped with receiving apparatus and distinctive sound-producing apparatus, navigation of vessels is perfectly feasible and safe during foggy or overcast weather. British ship owners, operating vessels between Liverpool and the St. Lawrence, estimate that they can save a day on each trip between these ports by eliminating the necessity of slowing down and stopping on account of the fog. In addition to the saving that will result in this manner, there should be a considerable reduction made in insurance risks for vessels which are so equipped as to locate themselves accurately in a fog.

NAVY YARD, NEW YORK. U. S. S. "VON STEUBEN." INSTALLATION OF BLISTER; ALSO SHOWING BURNEY GEAR.

## CONCLUSION

By proper cooperation between the navy, the lighthouse board and the merchant marine, it is felt that means can be provided for increasing the safety of naval vessels and our expanding merchant marine, and the cost of operating the merchant marine may be reduced.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

# U. S. NAVAL ORDNANCE PLANT, CHARLESTON, W. VA.

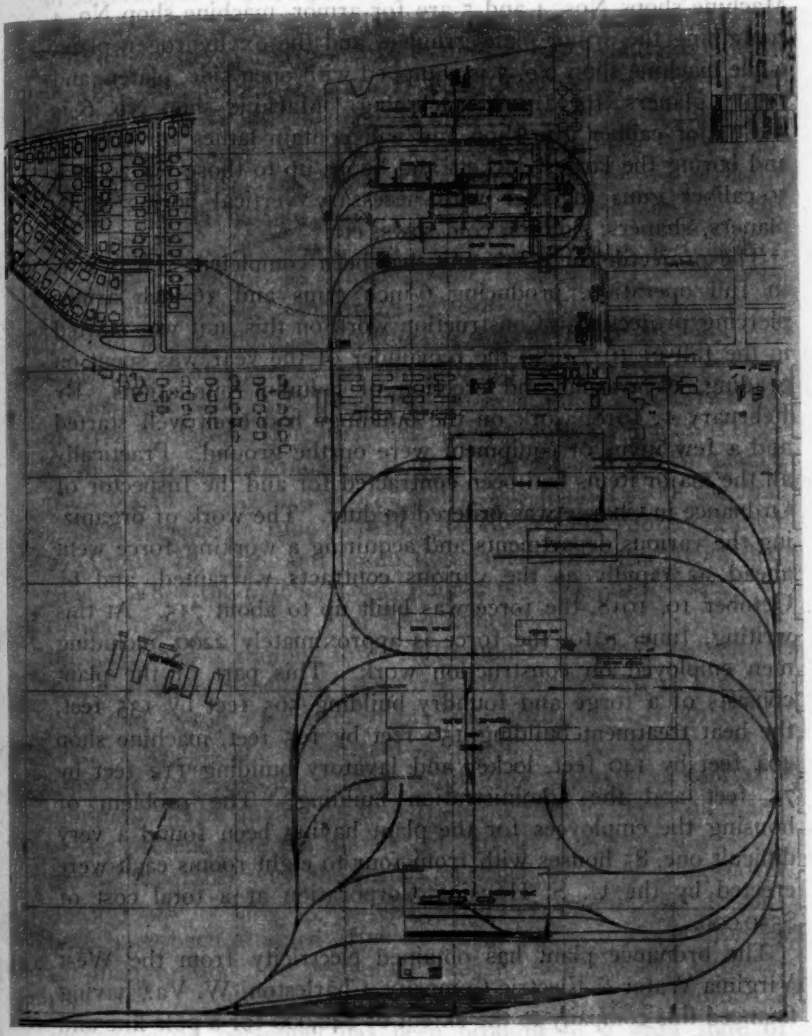
By LIEUT. COMMANDER W. L. AINSWORTH, U. S. Navy

The U. S. Naval Ordnance Plant has come into being as the leading competitor of the large steel companies for government contracts for armor and naval ordnance. As early as 1900 the Navy Department brought before Congress the necessity for a government armor plant, but nothing definite was done until 1916, when the 64th Congress appropriated $11,000,000 for the construction of a "Plant for the manufacture of armor for ships of the navy," and $700,611 for the construction of a projectile plant. This amount was further augmented when the 65th Congress appropriated $1,375,345, thus making the total appropriation $2,080,956 for the plant for the manufacture of projectiles. A site comprising 207 acres was chosen at South Charleston, W. Va., and work was started August 30, 1917. In August, 1918, the President allotted $4,121,000 from the appropriation for "Increase of the navy armor and armament" for the construction of a gun forging plant. This extra allotment allowed the projectile plant to be increased in size and equipped with the necessary machinery for the production of minor caliber guns.

Upon the settling of the various contracts with plants of cost plus contractors, a large amount of navy owned machinery was available for installation at this plant, thereby extending its facilities at a great saving to the government. The acreage is of such size that the Bureau of Ordnance found it practicable to receive and store several thousand tons of ingots, billets and three, four and five-inch gun forgings which will be held in stock to cover the needs of the navy for a long period to come.

The armor or south unit of the ordnance plant is still in process of construction and is about 45 per cent completed. This

unit covers 152 acres and when completed will comprise the entire plant of five buildings for the construction of armor plate and major caliber gun forgings. The open hearth building located adjacent to the C. & O. Railway tracks will be a building 516 feet by 225 feet and will contain two open hearths of 65-ton capacity and two electric furnaces of 30-ton capacity. The largest ingots contemplated are those for armor plate, which will weigh in the neighborhood of 200 tons. This building is equipped with one 250-ton crane, one 125-ton crane and one 75-ton crane, all of 100-foot span. The charging aisle is equipped with a 25-ton crane and the stock yard has two 15-ton cranes of 100-foot span. The forge and furnace building is located to the northward of the open hearth, and ingots are brought directly across to the furnaces on a transfer track. This building is 644 feet by 477 feet and has two large wings containing furnaces with the press between these wings. Each wing has one 250-ton, one 200-ton and one 100-ton crane, all of 100-foot span. There is also one 75-ton crane over the press for erecting and repair purposes. The south wing contains the forge furnaces for armor and large guns, and in addition two gun annealing, car-bottom furnaces, one 100 feet long and one 50 feet long. After proper heating the armor ingots are forged on the 14,000-ton press into plates varying in thickness from 4½ inches up to 20 inches. Some of these plates are as much as 13 feet wide and 28 feet long. The large, round corrugated gun ingots are hollow forged on this press into lengths as great as 93 feet. After leaving the press the forgings go to the north wing of the building where the annealing, carbonizing, tempering and hardening furnaces are located. A boiler house with five 1000 horsepower boilers will be built near the forge building to produce steam for the press. The heat treatment building is 320 feet by 112 feet and is built up at the west end to a height of 176 feet to accommodate the vertical furnaces. There are two vertical furnaces, one 105 feet by 10 feet and one 50 feet by 10 feet. The vertical quenching tank is 105 feet by 14 feet. Although some electric furnaces are used, both in the melt shop and heat treatment shops, natural gas will be used almost entirely in all other furnaces. There are three 75-ton cranes in this building. The machine shop building of the south unit is 552 feet by 320 feet and contains machine shops Nos. 4, 5 and 6, each of the three bays of



GENERAL LAYOUT U. S. N. O. P., SOUTH CHARLESTON, W. VA.

the building being a separate shop 100 feet wide. Each of these shops is equipped with one 150-ton crane and one 75-ton crane. Machine shops Nos. 4 and 5 are for armor, machine shop No. 4 containing the armor plate grinders and the oxyhydrogen plant, while machine shop No. 5 is equipped with open side, platen, and rotary planers, for armor machining. Machine shop No. 6 is the major caliber gun shop and will contain lathes for turning and boring the largest jackets and hoops up to those for 20-inch 50-caliber guns together with necessary vertical boring mills, planers, shapers, slotters, cold saws, etc.

The projectile, or north unit, has been completed, and is now in full operation, producing 6-inch guns and 16-inch armor piercing projectiles. Construction work on this unit was started in the fall of 1917, and the remainder of the year was spent on grading, excavating and erection of column foundations. By February 1, 1918, work on the buildings had been well started and a few items of equipment were on the ground. Practically all the major items had been contracted for and the Inspector of Ordnance in Charge was ordered to duty. The work of organizing the various departments and acquiring a working force went ahead as rapidly as the various contracts warranted, and by October 19, 1918, the force was built up to about 715. At this writing, June, 1919, the force is approximately 2200, including men employed on construction work. This part of the plant consists of a forge and foundry building 565 feet by 135 feet, the heat treatment building 156 feet by 105 feet, machine shop 404 feet by 140 feet, locker and lavatory building 112 feet by 75 feet and the administration building. The problem of housing the employees for the plant having been found a very difficult one, 85 houses with from four to eight rooms each were erected by the U. S. Housing Corporation at a total cost of $550,000.

The ordnance plant has obtained electricity from the West Virginia Water & Electric Company, Charleston, W. Va., having financed this company to the extent of $40,000 for a pole line and transformer to the plant. A further supply will be obtained from either the Virginian Power Company or a successful bidder for the nitro plant. Gas is obtained from the United Fuel Gas Company of Charleston, West Virginia, with whom a contract was made on October 22, 1917, for the installation of a 4-inch

pipe line about 2000 feet in length to the plant and for the supply of natural gas at $0.08 per 1000 cubic feet. Later this pipe line was paralleled by an 8-inch line installed by the plant force. In addition to this source of supply of natural gas, negotiations with the Charleston-Dunbar Natural Gas Company in July, 1918, resulted in the contract for a five years' supply of natural gas from the property leased by that company in the vicinity of Hurricane, West Virginia. The high pressure 8-inch main delivers natural gas to the plant where it is distributed to the various units.

The plant obtains its drinking water from the West Virginia Water and Electric Company, which supplies the city of Charleston and will in addition obtain water directly from the river, the construction of a large dam affording a cooling basin.

The melt shop No. 1 is equipped with three 6-ton Heroult electric furnaces. The east end of the building contains two 60-inch cupolas and molding floor. Operations in the ordnance plant began here with the heat which was poured from the first electric furnace on June 6, 1918. All furnaces were in operation by August 18, 1918, and production rapidly increased from that time. When the first heat was poured only two men carried on the melt shop roll had ever seen molten steel before. To-day the melt shop is running three shifts under the competent supervision of trained melters. All three furnaces are tapped into one ladle and 18-ton alloy steel ingots for 6-inch jacket forgings are cast. Furnaces are in constant operation and the percentage of time lost for necessary repairs, relinings, etc., has been kept at a minimum. The quality of steel from the first has been high and at the present time the number of rejections is very low, comparing favorably with the results obtained by other plants after more years of operation under favorable conditions. Results here have been attained after less than one year's operation by the inauguration of a system of intensive training and unremitting supervision by those in charge, and by their efforts the inexperienced personnel has been brought to a high state of efficiency.

Forge shop No. 1 is located in the west end of the forge and foundry building. The equipment consists of one 3000-ton press, one 500-ton press, eleven forge furnaces and five car-bottom annealing furnaces. All these furnaces use natural gas

for fuel. Forging operations began on July 6, 1918, when the first forging was brought under a hammer and work started on a job order for twenty 5-inch mushrooms. The 3000-ton press is operated by four hydraulic pumps and an hydraulic intensifier. This press was received in several shipments and was finally erected by the plant force and put into operation October 20, 1918. The production was very slow at first owing to inexperienced labor, but at present both forge presses are operating near capacity and all work for 6-inch liners, tubes, and jackets, and 16-inch counter recoil cylinders is carried forward with speed and accuracy.

Heat treatment shop No. 1 is adjacent to and just to the south of the forge and foundry building and connected thereto by a transfer track. The equipment consists of four special double furnaces for the heat treatment of projectiles and miscellaneous small forgings, and two continuous shell treating furnaces. Two vertical gas-fired, semi-muffle furnaces are in process of construction. There are at present three quenching tanks and a vertical spray will soon be added to this equipment.

The machine building includes machine shops Nos. 1, 2 and 3. Machine shop No. 1 is the tool shop and is equipped with ten lathes with the necessary cutters, tool grinders, planers, shapers and milling machines. Machine shop No. 2 is equipped for handling guns up to 6 inches and has three heavy duty lathes 36 inches by 60 feet, two heavy duty lathes 42 inches by 40 feet, two triple gear lathes 60 inches by 40 feet, two double end borers 46 inches by 48 feet, and one boring lathe 36 inches by 60 feet. This equipment is felt to be amply sufficient for handling all minor caliber gun contracts at the present time. Machine shop No. 3 is equipped for handling 14-inch to 16-inch a. p. projectiles. There are eleven lathes 36 inches by 20 feet, and turret lathes, combination milling and turret lathes, etc., capable of handling shell up to 20 inches.

The projectile plant is now getting on its feet as a live and going concern. Difficulties at first experienced because of lack of competent artisans have been forgotten. Local clubs and organizations have sprung up among the workers and a healthy spirit is manifest on every hand, the foremost object being the production of more and better material and the construction of a bigger and better plant. Shipments are being made with

increasing rapidity upon the contracts now held and the cry of the future is bound to be for more work to do. The overhead cost of production during the first few months was very high owing to the fact that work was undertaken with the training of the personnel as the ultimate objective, combined with a willingness to pay the price such education demands. It can safely be said that the hardest part of this training period is now over and the production costs may reasonably be expected to reach a satisfactory figure.

On the armor plant side 15,000 cubic yards of concrete work and 10,000 feet of permanent track have been completed, and at the present writing the structural steel is being erected for the open hearth and machine shop buildings. Another year should see the south unit of the plant in operation and taking the first steps toward the production of the armor and huge guns which will make the United States the proud possessor of the finest fighting ships in the world.

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# THE NAVAL ACADEMY COLLECTION OF PAINTINGS

By SIDNEY GUNN, Curator, U. S. Naval Academy

In the course of its history the Naval Academy has accumulated a collection of paintings that gives it a considerable importance as a repository of American art. Of course the chief value of most of its pictures is historical, but some museums devoted exclusively to the exhibition of art would be glad to equal its collection in number, and few have better specimens of the work of some of the foremost American artists.

Most of its pictures are, naturally, portraits, but the collection includes some landscapes and seascapes that are not without interest. The chief of these is, perhaps, a picture of the *Constitution* and *Guerrière* in the office of the Senior Assistant to the Commandant in Bancroft Hall. This is an original painting by Thomas Birch, and it was presented to the Naval Academy by Mrs. Furbush of West Newton, Massachusetts, in 1908. It was painted in 1829 by Birch, who has been described as, "while not of the first rank, yet a careful, conscientious, painstaking artist." This establishes its value from an artistic point of view, but in addition it was viewed at the time of its presentation by Admiral Dewey, Rear Admirals Pillsbury, Dickins, and other prominent naval officers, who concurred in the opinion that "it is a realistic, patriotic, and noteworthy representation of a great naval achievement," which indicates that it satisfies the standards of men familiar with the conditions it undertakes to depict. On the whole, this picture is of artistic merit and great historical and naval importance.

There are also, in the office of the commandant, four other pictures of the fight between the *Constitution* and the *Guerrière* which represent different stages of the battle. They are entitled: "The Engagement," "In Action," "Dropping Astern," and "She Fell in the Sea a Perfect Wreck." There is no adequate

record yet established of these pictures, and the artist is in doubt. They would also probably not impress those familiar with the sea as being as accurate and realistic as the Birch picture, although they may be copies of Birch's own work, but they commemorate an event of historical importance and they undoubtedly possess some artistic value.

The *Constitution* has besides these pictures several other representations in painting and photography, and is the most celebrated ship in this respect in the Naval Academy. There is a picture of her capturing the *Cyane* and the *Levant,* in Memorial Hall. This was presented by the artist, C. T. Chapman of New York, in December, 1917. There is also, in the Reception Room of Bancroft Hall, a copy of a picture by Thomas Birch which represents "The Chase of the *Constitution,*" and there are several other pictures of *Old Ironsides,* some of which, however, have not stood the ravages of time sufficiently well to be fit for exhibition.

Another picture of historical importance is "The Battle Between the *Hyder Ali* and the *General Monk*" in the Officers' Mess. This picture celebrates the victory of Commodore Joshua Barney, U. S. Navy, in 1782, and is signed and dated as painted in Paris in 1802 by a well-known French artist named Louis Phillipe Crepin. Its presence at the Naval Academy is traceable from 1888, but no record earlier than that has yet been found, and its origin is still in doubt.

Still another French picture is the "Battle of Tripoli" in the Administration Building. This is signed by an artist named Corné; it is dated 1805, but no further record of it has yet been discovered. Its chief value is historical.

In the superintendent's house is perhaps the most ambitious landscape in the possession of the Academy. It is a "Landscape and Ruins," and has been attributed to many different artists, including Claude Lorraine; but it does not correspond to any of the sketches in the book which that methodical artist kept as a record of his works, and it is probably by a less famous painter. Nicholas Brand, a Viennese artist of the eighteenth century, has been suggested, and so has his father, Christian Hülfgott Brand, but this, and its attribution to a French artist of the school of Lancret, rests on nothing more substantial than conjecture, and conjectures are notoriously uncertain in the domain of art. The only possible trace of it so far found in the records is a vote of thanks tendered by the Naval Lyceum at a meeting held January

17, 1837, to Mr. V. Howland "for his donation of a landscape painting." In another entry Mr. Howland's gift is described as "a fancy landscape painting," but nothing more definite is on record that may conceivably refer to it, unless it is a gift by Mrs. Oliver Hazard Perry, who gave a painting of "The Ruins of Troy," a title which would not seem to fit this picture, even allowing for eighteenth century indifference to historical accuracy.

It will be seen that there are a number of pictures of French origin in the Academy collection, and these have been acquired as a result of French sympathy and admiration for the United States. There is now one German picture which did not come as a result of friendship, but as a trophy of the late war. It is an allegorical picture taken from the smoking room of the German auxiliary cruiser *Kron Prinz Wilhelm.* This ship was a North German Lloyd liner plying between New York and Bremen before the war. In August 1914, she put to sea and preyed on Allied commerce for 260 days, but was finally obliged to intern at Norfolk. When the United States entered the war she was taken over by the government, renamed the *Von Steuben,* and used as an auxiliary cruiser and naval transport. To avoid damage to it the picture, which was in the smoking room of the liner—the wardroom of the cruiser—was removed and sent to the Academy by the Navy Department. It is a large painting about six feet square, with an elaborate carved frame, and its title: "Unsere Zukunft liegt auf dem Wasser," "Our Future Lies on the Sea," the Kaiser's famous utterance, indicates that it symbolizes Germany's maritime supremacy. The signature on it, "A. Fitger," is that of Arthur H. W. Fitger, a well known and prolific German artist, who was also distinguished as a poet and dramatist, and who has many specimens of decorative art on exhibition in the principal German and Dutch cities. The picture shows two horses ridden by nude cherubs as postillions leaping over the waves and drawing a chariot in which is a partially draped figure holding a trident and a German flag in the left, and the reins of the horses in the right hand. In the right foreground is a seal lifting its head out of the water, and although the artist undoubtedly put this in for realistic rather than symbolical purposes, it will none the less serve as an unconscious prophecy of the submarine. This picture has been placed in the library of the Post-Graduate Department.

There are in Recreation Hall some rather notable marine drawings in the shape of some water-colors by Henry Reuterdahl.

There are ten of these and they were presented to the midshipmen of the Naval Academy by the Hon. George von L. Meyer in June, 1911, while he was Secretary of the Navy.

The most interesting pictures at the Naval Academy, however, are portraits. Of these three have been attributed to Gilbert Stuart, the greatest American portrait artist and among the foremost portrait painters of all time. His pictures command higher prices than those of any other American painter, and while market value is not a certain test of artistic excellence, and in the case of Gilbert Stuart there may be historical and social influences that tend to make Americans pay more for his pictures than they would for those of a painter whose works do not imply ancestors of prominence during the early days of the nation, nevertheless Gilbert Stuart was a great artist, and portraits by him are among the chief artistic treasures of the United States.

The three supposed Gilbert Stuart pictures in the Naval Academy are bust portraits of Commodores Bainbridge, Chauncey, and Decatur. The Bainbridge picture was presented to the Naval Lyceum of the Brooklyn Navy Yard (to which organization the Academy owes all its supposed Stuarts and most of its portraits) by Surgeon George W. Codwise, U. S. Navy, in August, 1839. There are two entries recording its receipt in the books of the Lyceum that have been thus far unearthed, but in neither case is the name of the artist given. In Mason's "Life and Works of Gilbert Stuart," however, on page 131, is a statement that Stuart's portrait of Commodore Bainbridge "has been deposited in the Lyceum of the Brooklyn navy yard." Mason's work was published in 1879 and is a fairly complete and accurate record of the paintings of Gilbert Stuart, so that its testimony goes a great way towards establishing the genuineness of the picture. There is confirmatory evidence also, for the picture has been engraved, and the frontispiece of a volume entitled "American Naval Biography," published in Philadelphia in 1844, marked "Wm. Bainbridge, painted by G. Stuart, engraved by J. Sartain," is unmistakably a reproduction of the Bainbridge portrait now in Memorial Hall.

Unfortunately, however, there is other evidence of a conflicting character. Another engraver has attributed the picture to Jarvis, and what is worse, an entirely different picture has been engraved and described as Gilbert Stuart's portrait of Commodore Bainbridge. This latter picture is the chief obstacle in the way of

believing the Memorial Hall picture of Commodore Bainbridge a Stuart, but it is a very formidable obstacle indeed, for it is quite in Stuart's style, and the man who engraved it was not likely to make a mistake.

The genuineness of the Bainbridge portrait is thus in doubt, and it may turn out to be the work of Jarvis, but the case of the Chauncey portrait is more promising. There is very little definite evidence relating to this picture, however. It was presented to the Brooklyn Lyceum in February, 1842 by Robert Smith, Esq. It is recorded twice in the books of the Lyceum, but, as in the case of the Bainbridge picture, in neither case is the name of the artist given. In Mason, however, on page 158, appears the statement that the portrait of Commodore Chauncey by Stuart " is in the Lyceum of the Brooklyn Navy Yard." It does not seem to have been engraved, and it suggests Stuart's quiet style, so it may prove to be what tradition calls it—a genuine Gilbert Stuart.

The third supposed Stuart portrait is that of Commodore Stephen Decatur, Jr., the most famous member of that family, who distinguished himself in the war with Tripoli and by the capture of the British ship *Macedonian* while he was in command of the U. S. Frigate *United States*. Unfortunately, the record of this picture is confused and contradictory. In Mason, page 172, is the statement: " The portrait of Stephen Decatur was presented to the Lyceum of the Brooklyn navy yard by Stephen Price, Esq." In the books of the Lyceum are two entries recording the receipt of the picture. One simply reads, under date of November 5, 1839: " Mr. Price, a portrait of Commodore Stephen Decatur "; but the other, dated November 12 of the same year, tells of the gift of a portrait of Commodore O. H. Perry executed by Mr. Mooney of Warren Street, New York, and then adds: " Ditto of Commodore Stephen Decatur, U. S. N., by Jarvis, presented by Stephen Price, Esq., of New York through Commodore Charles G. Ridgely, U. S. N." In addition to this the picture has been engraved and attributed to Jarvis, and reproductions of the plates, which are in the possession of the Academy, are in the office of the Aid to the Superintendent, the Officers' Mess, and elsewhere throughout the Academy. This picture is an unusually good one, but it has a romantic suggestion that is more like Jarvis than Stuart, and besides this another picture has been engraved and was reproduced in the *Analectic Magazine* for May, 1813, as Gilbert Stuart's portrait of Stephen Decatur. It is also true that

Sully painted a picture of Stephen Decatur for Stephen Price, Esq. In 1814, while Lieutenant Oscar Bullus, U. S. Navy, deposited a picture of Decatur with the Brooklyn Lyceum in 1836. Now there is a very fine bust portrait of Decatur by Sully in the superintendent's house which might seem to be the one painted for Mr. Price and erroneously recorded as a Stuart but it is more probably a drawing made for a Congressional medal, while the Memorial Hall picture may be the one given by Lieutenant Bullus, and may be by Jarvis. In addition a supposed Stuart portrait of Decatur was sold recently to Mr. Charles A. Munn of New York, and another is in the possession of Mr. Wm. Decatur Parsons of New York, and was painted by Stuart from life and inherited by Mr. Parsons, who is a descendant of Commodore Decatur's brother.[1]

There is another possible Stuart, however, in the picture of Commodore Perry in Memorial Hall. It may be the work of the Mr. Mooney, whose picture of Commodore Perry is recorded along with Mr. Price's gift of Decatur's portrait, but the whole matter is in doubt and will require further investigation.

Sully, who is second only to Stuart among American portrait painters, is credited also with a picture of Commodore Charles Stewart in the superintendent's house, and the picture may be his work, but the record is not yet clear and there is the possibility of further confusion with Stuart. It is probable though that this picture together with those of Commodore Jacob Jones and Decatur, was made by Sully for Congressional medals.

Waldo, another prominent painter of the early part of the nineteenth century, has one specimen of his work in the portrait of Captain James T. Leonard in Recreation Hall. The record of this picture is unusually clear, for there is a letter from its donor, Edward Crommelin, Esq., of New York, stating that it was painted by Waldo while Captain Leonard was commandant of the naval station on Lake Champlain in 1828-29. This is a good picture and is plainly the work of a skilful artist.

Other pictures of historical interest are in the Officers' Mess. There are eight pictures of the first presidents of the United States: Washington, Adams, Jefferson, Madison, Monroe, John Quincy Adams, Andrew Jackson, and Martin Van Buren. The first seven of these were presented to the Naval Lyceum in Decem-

[1] Another possible Stuart portrait of Commodore Decatur is in Independence Hall, Philadelphia.

ber, 1835, by Luman Reed, Esq., of New York. Mr. Reed's letter accompanying the gift has not been found among the Lyceum papers, but fortunately it has been published in the *Naval Magazine* for January, 1836. It gives complete details as to their origin, and states that the pictures of Washington, John Adams, Jefferson, Madison, and Monroe, were painted by Asher B. Durand from originals by Gilbert Stuart, and that the pictures of John Quincy Adams and Andrew Jackson were painted from life, in 1835, by the same artist. Durand was a well known engraver and portrait painter of that day, and the pictures are creditable works. The picture of President Van Buren was given to the Lyceum in 1840 by John R. Livingston, Esq., of New York. It is described as an original, and the artist is said to be one "Nimes" of New York, but there is no complete record, as there is of the other pictures of the presidents.

It will be seen that most of the pictures so far described are from the collection of the Brooklyn Naval Lyceum, which was inherited about thirty years ago and forms a link between the old navy in which the officers were trained afloat and the Academy. There are, however, many other pictures which have been given directly to the Academy.

The most conspicuous places in Memorial Hall are occupied by pictures of Admirals Dewey, Farragut, and Sampson. Those of Admirals Dewey and Sampson were presented by officers of the navy, through Rear Admiral F. E. Chadwick, U. S. Navy, in 1911, and that of Admiral Farragut was presented through Admiral Dewey at the same time. N. M. Miller is the artist who painted these three pictures.

There is also a large picture of Commodore John Barry in Memorial Hall. It was presented by Rear Admiral Pierce Crosby, U. S. N., and was painted by Robert Hinckley of Rehobeth, Delaware, who painted the picture of Commander W. B. Cushing, which is also in Memorial Hall, and that of Admiral du Pont in the Reception Room of Bancroft Hall.

The portrait of Admiral D. D. Porter in Memorial Hall was presented to the Naval Academy by the Porter family, through Commodore Theodoric Porter, U. S. Navy, retired, shortly before the death of the admiral. It is a large picture similar in character to those of Admirals Dewey, Farragut, and Sampson, and was painted in Germany about 1885.

Another picture of historical as well as artistic distinction in the Naval Academy collection is the portrait of John Paul Jones

in Memorial Hall. It was painted by Cecilia Beaux, and was presented to the Academy by the Class of 1881 on the twenty-fifth anniversary of its graduation in 1906. This is probably the best portrait of Jones in existence from an artistic point of view.

The Academy has many other pictures, but those described above are the outstanding ones. There are one or two unidentified pictures, and there are several recorded but as yet not discovered. Recently a picture recorded but not exhibited was discovered, and it may be that others will also be found. The picture referred to is a portrait of Rear Admiral John L. Worden, who commanded the *Monitor* in her engagement with the *Merrimac*. It was bequeathed to the Naval Academy by the late William McMichael Woodworth of Cambridge, Massachusetts, and was received in October, 1912. It is a remarkably good piece of work by a German artist named Gliemann, who was active during the third quarter of the nineteenth century and achieved considerable distinction. Few portraits in the entire collection of the Naval Academy surpass it in workmanship or effectiveness, although many are by artists of greater, or at least more widespread and longer established reputation. It of course has a special interest for the Academy, because, apart from his connection with an engagement that effected a revolution in naval construction, Admiral Worden was superintendent from 1869 to 1874.

In addition to the pictures above described there are portraits of Admirals du Pont, Godon, Livingston, McDougall, and Bailey; of Commodores Champlin, Hull, Downes, Kelly, M. C. Perry, Preble, Macdonough, Rodgers, Salter, Nicholson,[2] Gerry, McKeever, and Woolsey; of Captains Biddle, Bolton, Percival, Shaw, and Turner; of Lieut. Commander Moreau Forrest, and of Ensign Worth Bagley, besides some unidentified pictures. It is not possible to discuss these pictures, however, because of the present incompleteness of the records relating to them, but many of them have considerable artistic as well as historical value. Certainly the Naval Academy has a very creditable collection of paintings and an excellent foundation on which to build a pictorial record of the personnel and achievements of the navy that will be an inspiration to its future officers. No institution has a better claim to pictures of naval interest than the Naval Academy, for nowhere can they be more effectively used.

[2] This picture has been marked "Samuel Nicholson," but it is certainly not a portrait of any one of the Revolutionary period, and just who it is, is in doubt; it may be Commodore J. B. Nicolson.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

# SHIP'S SPIRIT

By COMMANDER GEORGE P. DYER (S. C.), U. S. Navy

## A STORY OF THE PACIFIC FLEET

The cruiser *Colorado* was certainly a happy ship. Forward and aft she had the unity and cheerfulness which is the goal of every commanding officer's desire, and which is not always so easily attained. It is my belief that good feeling among the officers, justice at "the mast" in dealing with offences, and good fare for the men have most to do with it; but you can never tell. A ship either has it or hasn't, and all an officer can do is to thank Heaven if he wakes up some fine morning and finds the spirit he prays for is there. What a spirit the old *Colorado* had let the following story illustrate. I can vouch for its absolute truth as to essentials and for its being as nearly true as to details as can be expected of any good yarn.

Not so very many years ago she was in a home port after a visit to the west coast of South America. The senior engineer had some guests to dinner on board. They were friends who had been kind to Mrs. Chief during a family crisis while he was away on a cruise. The wardroom officers' messroom had been gaily decorated in the customary manner, by some of the quartermasters. Its metal walls, with their shining paint and brasswork, were covered by the folds and festoons of signal bunting. The steward had laid himself out on the table decorations and the dinner. The warrant officers' mess had lent its candelabra, cunningly wrought of empty cartridge cases by the gunner's gang. The doctor had written some of his easy flowing doggerel for the place cards. Everyone, in fact, recognized that the chief was digging quite a hole in his

pay in appreciation of help in time of need; but knowing the circumstances or not, all hands pitched in cheerfully to make the occasion a success.

After the table was cleared of everything save the liqueur glasses and coffee cups, someone stopped the band and sent it forward with a bottle of beer tucked under each jacket. There was the babel of topics which collide when a mess dinner is well underway. The confusion and animated talk gave the usual result of curious disjointed sentences. Have you ever noticed this effect at a big table? "There's no use putting an enlisted man on bread and water . . . . when a torpedo can make forty knots . . . . I'll ask for four days' leave, and tell him . . . . we must get the navigator to sing 'The Coast of the High Barbaree' . . . . thirty million Chilean dollars they said it cost . . . . Yes, all our boys are Filipinos; we enlisted them in . . . . Gibraltar—a good place to stock up with . . . . butter sauce."

From the tangle the executive picked the most obvious. Experience indicated someone had told the paymaster what his contribution to the guests' entertainment would be, and that he was "winding up." The presiding officer recognized the cue to open the way. Our teamwork in the mess was perfect in such matters.

"See there," he nodded down the long table, "'Pay' is telling how we snaffled the prize at Valparaiso last fall by purely Yankee methods. It's worth listening to."

A voice was booming out from the "fourth ward" where the officer referred to had stowed himself among the younger officers and guests.

". . . . and take it all in all, it was the most elaborate celebration the old *Colorado* had ever poked her nose into."

"When the paymaster makes that statement, ladies and gentlemen," said the executive officer, "you may accept it as final authority. He's been the first man ashore and the last aboard at every flower show we've been to in the past three years, from Seattle to Santiago, or Potlatch to Philippines."

The paymaster turned a tolerant eye toward the head of the table.

"Be that as it may," drawled he, "the commander knows if it hadn't been for his pet beach hitting 'Pay,' we never would have walked off with that piece of bric-a-brac there."

He indicated a bronze statuette which stood on the piano.

"That young lady represents an achievement typical of the *Colorado*. I happened to be the apex of the wedge which broke through our difficulties, but it was the old ship which furnished the spirit. Remember that night, Cranford?"

The good looking youngster referred to smiled back across the table.

"I'd never forget it, even if you fellows would let me."

"Well," continued the paymaster, "There we were in Valparaiso. As usual with such fêtes, we were simply overwhelmed with hospitality. This was even worse than usual, if one may so refer to being smothered in kindness. The Chileans don't have a hundredth anniversary of their independence often, and they celebrated this one sumptuously. They hired a whole hotel, lock, stock and barrel, and turned it over for the free use of visiting naval officers. They imported an extra cargo of champagne for their guests. The Chilean naval officers had a club on the harbor side, and fixed it so it was hard to land without passing through its bar to the street. You would always find there a splendid lot of fellows from all the navies of both hemispheres. After taking one drink with your hosts you had to take another—or get your clothes torn in breaking away!

"The Chilean civil authorities organized themselves into a never-a-dull-moment association—balls, picnics, dinner parties, excursions, high masses, parades. I never saw anything like it.

"The harbor was filled with foreign men-of-war. So to the schedule ashore was added the round of official calls, dinners, etc., which must be interchanged when such a gathering takes place. Every few minutes, it seemed, the officer of the deck's messenger would report, 'Sir, some German officers calling on the wardroom,' or, 'Sir, a Brazilian boat with officers is coming alongside.' Crowded and weary as we were then, with the ship's work to be kept up, such calls rang dully on our ears.

"After the first few days even the hardened fussers and feasters amongst us broke down and went on the sick list to get a chance to recuperate. It was impossible to get volunteers to appear at the various festivities. So the captain had to look us over and *order* the most fit to go to this ball or that dinner. How the 'old man' stood it himself I don't know, for he was harder pressed than any.

"You may dimly imagine my feelings, therefore, when one morning he sent for me. I found him in the cabin being shaved.

"'Paymaster, don't you know something about water carnivals?' came from somewhere under the lather.

"'Yes, sir, while I was in the Atlantic fleet we had them at Guantanamo and Bar Harbor. Good Lord, captain, we're not in for one of those?'

"'Yes, son, we are, and late into the bargain!' He tossed a paper to me. I read aloud:

"'The captain of the port requests that description of entries by visiting war vessels for the grand and other prizes in the coming night water carnival be sent to his office by noon to-day.'

"'Three days to rig a float! Pretty snappy work will be in order! *That* explains those beautiful little caravels the Argentines had hauled out to their boat booms! I wondered when I saw them last night. . . . . Why didn't we hear of this before, captain?'

"'Lost in the rush, I suppose. When I signalled just now, the flagship claimed that a letter directing us to enter a float was sent by guard boat over a week ago. Anyway we've got to do it, and the *Colorado* must produce a float which does not disgrace her!'

"'Aye, aye, sir,' was what I said. What I felt is not fit to be recorded.

"'I'll tell the executive to belay any other work necessary to give you the help you need. I have to go to Santiago tonight for the program up there; but after you young hustlers in the ward-room get started on it, I'll know that when I come down with the official party from the capital to see the water party parade, I won't be ashamed of the *Colorado's* exhibit.'

"That was just like the 'old man!' I left the cabin feeling I wouldn't have him disappointed if it took a leg. As a matter of fact it did; or the next thing to it. But that is ahead of the story.

"Down in the ward room I called a counsel of war.

"'See here you people, the skipper has detailed me to get up a float in three days for a water parade. Come across with your suggestions. It looks to me as though it were nerve and ingenuity

against time. Those Argentines have some miniature caravels that must have taken months to put together. What can *we* do?'

"The chief there suggested a rubberneck wagon with a barker instructing the occupants as to the sights in the harbor.

"Someone else thought Neptune and his attendants in a giant shell chariot would be fine. The frivolous remark was made that the temporarily disorganized condition of drills and routine generally, could be best illustrated by a lonely sailor perched on a pedestal sawing away on a bass viol, with the legend 'Excused from all duty, but fiddling.'

"'Won't do,'" I announced. "'All either take too much time or won't be understood. We must get something as powerful and elemental in its appeal as a punch of the White Hope. . . . Here's an idea! These Chileans are so full of patriotism that it oozes from every pore. Whether it's because they're so isolated by the Andes—or see Argentina passing them in the race for wealth and population—or that the Panama Canal threatens to side track them forever—every other native I meet asks me what I think of Chile and the Chileans. And if my enthusiasm doesn't instantly boil over, his face falls about a foot. We can build a whopping big Chilean flag in electric lights, mount it on a sailing launch, and conceal the band under it to play their National air. Unless I miss my guess, this will make a hit with them.'

"As no one could make any better suggestion, this plan was submitted to the executive, and soon we had the necessary people busy with the preparations. The carpenter's gang started with a will on the staging and framework; electricians on the wiring; machinists on connecting up the dynamo with the steam launch engine which was to furnish the power. But with all our efforts, time was woefully short, and when the late afternoon of the day of the carnival arrived, we had not been able to have a 'dress rehearsal.'

"In the meanwhile, I had been laying foundation for the reception of the exhibit by hinting darkly to all the Chilean officers whom I met, that we thought the *Colorado's* float was rather exceptionally good. I knew this gossip would spread, and counted on its producing a favorable state of mind in which to receive our contribution to the carnival evening.

"The last touch of paint was put on, the sailing launch bearing

the float was hoisted out of its cradle by the big crane, and set in the water. Shortly afterwards a chief electrician sought me in my room.

"'Paymaster, we can't get enough juice through to the lights!'

"'Great Heavens, Smithers, what do you mean?'

"'We've just tried her out and the belt between the dynamo and the engine stretches and slips so that we can't seem to generate more than enough current to put a dull glow on the lamps!'

"I went over the situation with him, hurriedly. It appeared there was no suitable belting on board. The other ships which had been signalled to couldn't produce any. It was too late to make a purchase ashore. All the other remedies I could suggest had been tried. As a climax, a messenger broke into our consultation with: 'Sir, the officer of the deck says it's time for our float to shove off, and report to the grand marshal of the parade.'

"I went up on deck in a pretty wild state of mind! Here we were expected to make a showing with a float that wouldn't function. . . . . we should be the laughing stock of the fleet! I had a vision of the 'old man's' face when, on the judges' stand, the vague outlines of a rough framework went by, and was identified as his exhibit.

"Cranford was on the quarterdeck taking an airing before dinner. Heaven knows what Providence placed him there at that particular moment! My eye lighted on him. As you can see for yourselves, ladies and gentlemen, he is the man for an emergency.

"'Here, Cranford,' I said, 'we are strictly up against it.' In about four sentences I rapped out the situation to him. So much goes on at once in a big ship that he hadn't heard any of the details.

"'She's due to shove off now, and I can't go with her because I'm assigned as one of the parade marshals. Down into the boat with you, and make those lights go if you have to crank that dynamo by hand!'

"'But, paymaster, my dinner. . . .'

"'Hang dinner,' I exclaimed, as I slipped my arm under his elbow and drew him to the gangway. 'This is a case of life and death with the ship's reputation. I'll square your leaving with the executive officer!'

"He bundled down the ladder. Halfway he turned with the surprise not yet off his face.

"'But, pay——' 'But nothing,' I interrupted. 'If you can't make those lights go all the time, on your life be sure they are on when you heave in sight of the judges' stand; and keep the band playing the Chilean anthem as long as there's a Chilean within hearing—or a toot in the bandsmen!'

"The officer of the deck stood grinning at the head of the ladder.

"'Shove off,' he ordered.

"Cranford jumped into the boat and as she moved away I thought I heard a final expostulation.

"'But, pay——'

"There was a launch waiting at the opposite gangway to take me on my duty. I held it long enough to go to the executive's room, and tell him briefly about Cranford. I was on deck again in a couple of minutes, and shoved off in turn.

"When I got in to the landing it was falling dark. There was the worst confusion of floats and pleasure craft you can imagine. It was a gay scene though, for all of them had lights and joyous parties aboard. Searchlights from the ships and buildings near by played impartially upon the throngs of spectators afloat and ashore.

"I was assigned to a section some distance to the rear of our exhibit; and so for a while lost sight of Cranford. I couldn't forget him for a moment, though!

"The parade finally started. Its route lay close in for a mile or so along the harbor's quay wall, now crowded with people. At the farther end of this wall was the judges' stand. As the floats passed in review, the line was to turn seaward and thread its way up and down the lanes of warships which made a checkerboard of the harbor.

"When by cajolery and command, blackguarding and suavity, somehow, I got my section organized so I could leave it for a few minutes without its losing all semblance of order, the part of the parade with our float was more than half way up the quay. As my patrol launch sped up the line, I overhauled float after float of remarkable beauty. Lighthouses, dragons, pirate ships, all sorts of craft, glowed and flashed in the wonderful night. I

watched with faint heart for the blank in the line of light which might indicate the position of our boat.

"Suddenly the scattered cheering ahead of me broke into a roar. 'Viva Chile' resounded from thousands of throats. It fell, only to rise again, and sweep along the crowd ahead. It was not until I nearly reached the judges' stand that I could make out its cause. When I did my heart jumped.

"Full and effulgent against the blackness of the night shone the single starred flag of Chile! Well under it, down near the waterline sparkled the name of the *Colorado*. Hidden in the bottom of the big cargo launch, the band was blaring out the inspiriting strains of the music the crowd loved so well.

"The thousands in the judges' stand rose as one man when they in turn recognized the emblem and the compliment it conveyed. Handkerchiefs and hats waved frantically. Such a burst of 'Vivas' came from them as you never heard. It continued, too, at full volume, all the time our float was in front of the stand.

"But no sooner had the flag passed this crucial point than its lights dimmed and went out.

"I ranged within hail. 'Cranford there! Splendid work!' I shouted through my megaphone. The answer came back at once angry and rueful.

"'Damn it, paymaster, you owe me a new pair of trousers. Besides that I won't be able to sit down for a week!'

"A glimmering of the truth came to me.

"'How's that?'

"'*The only way I could keep that cursed belt tight was to sit on it while it was running!*'

"An uproarious shout of laughter from my boat, as I fled back to my station, was his only reply.

"Afterwards, I heard that our float was a thing to jeer at by our ships. When it arrived opposite each one, its lights would go on for a brief moment or two to show what we could do; as Cranford, or one of his men, would submit themselves to their modern form of torture. Then it would again become part of the darkness of the night. As for the foreign ships, so far as I could learn, they never recognized it at all!

"When the parade was over I picked Cranford up and took him back to the *Colorado*. On the way he was silent, not to say

morose, and nothing I could say between recurrent spasms of chuckles cheered him up. Nor did he regain anything like his normal spirits until he had changed his clothes, and taken a bottle of beer and the cold snack the steward had saved for us.

"When I got him into a state of mind more fit for presentation, I took him up to the cabin and told the captain of his gallant conduct! The 'old man' listened gravely and congratulated Cranford warmly, with a twinkle in his eye. For weeks afterwards there was mock solicitude as to Cranford's health at the wardroom table.

"Next morning the flag lieutenant came over to the ship on some errand. I saw him on deck waiting for his boat to come alongside. He tried to run me about our float.

"'I say, paymaster, were you responsible for that dark secret the *Colorado* perpetrated last night? If an enemy's torpedo boats could only discover your perfect method of approaching unobserved, we wouldn't stand a chance!'

"'You're jealous,' I parried, laughing. 'The flagship's little conventional float might be better seen, but lacked the imagination of our conception!'

"'Well, we expected to see *something* from the *Colorado,*' he said, 'and for a few seconds some of us thought we did, but the glow of your "conception" was too fleeting for our mere human eyes.'

"Just then the bugle sounded attention; and as we faced toward the gangway we saw a number of Chilean officers and civilians come over the side and be met by the captain. One of them carried a bulky package.

"Then and there the miracle happened!

"One of the Chileans began in somewhat flowery terms to describe his party as the water carnival committee; and wound up by saying to the captain that it had paid him this visit for the purpose of congratulating him and the ship on the award to her of the grand prize for her float! As he took the wrappings from the young maiden you see there on the piano, he said in substance:

"'It is not only the beautiful character of your float, but the ingenuity and imagination of its conception which determined the judges on this award; and which deeply touched the hearts of our people!'

"When the captain had sufficiently recovered, he took the committee below for the usual ceremonies.

"Whoops of jubilation began to spread through the ship, as the news leaked forward amongst the men. I turned to the flag lieutenant.

"'Now, what do you think of that?' I asked.

"'All I've got to say, "Pay," is that in a long experience of watching the *Colorado* slip things over, this absolutely takes the cake!'"

# U. S. NAVAL INSTITUTE

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ANNAPOLIS, MD., JANUARY 15, 1920.

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# PROFESSIONAL NOTES

PREPARED BY

LIEUT. COMMANDER WALLACE L. LIND, U. S. Navy

## GENERAL ARRANGEMENT


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## GREAT BRITAIN

THE BRITISH WARSHIP "HOOD."—Interesting facts concerning the new British warship *Hood*, variously designated as battleship and battle cruiser, which were necessarily held secret during the war with Germany, have been given out by the British Admiralty to the *Engineer*, of London, which in its issue of November 7 published a description of the monster ship with pictures of her model made by John Brown and Company, her builders.

The *Hood* combines all the features of the battleship and the battle cruiser, and is the largest warship ever put afloat up to the present time. Whether she is the most powerful warship in the world afloat, as has been stated, is a question which seems open to debate, according to some great gun experts. It has still to be proved by battle experience whether the eight 15-inch guns of the *Hood* would be more effective than those of a vessel of her class armed with 12 guns of the 14-inch caliber, like those aboard the U. S. S. *New Mexico*. While the eight 15-inch guns may have the greater range and penetration, it is questioned whether this advantage is enough to offset the greater volume of fire of twelve 14-inch guns, if fired within a range effective for both calibers of guns. This is a point upon which ordnance experts differ. The United States Navy Department, however, evidently has faith in the bigger gun, for the new battle cruisers of the *Constellation* class, authorized to be constructed, will be provided with a main battery of eight 16-inch guns, instead of a larger number of smaller caliber guns.

The *Hood* has the armor and guns of a battleship and the speed of a battle cruiser, and her designer, Sir Eustace d'Eyncourt, chief constructor of the British Navy, has produced a ship that embodies every essential improvement based on experience in the battle of Jutland and other engagements during the war with Germany. The *Hood*, therefore, represents a remarkable combination of naval construction. Her cost, exclusive of guns, ammunition and stores, is given as £5,000,000. Her length on water line is 860 feet; beam is 104 feet; draft, 28½ feet; displacement, 41,200 tons. The shaft horsepower of the *Hood* is intended to work up to 144,000, which

is equivalent to a speed of 31 knots. Her engines are geared turbines of the Brown-Curtis type, steam being supplied by water-tube boilers, the furnaces using oil for fuel, of which 40,000 tons are carried.

The main battery of the ship comprises eight 15-inch guns, which have proved reliable up to 28,000 or 30,000 yards, and discharge a projectile of 1920 pounds. The guns are mounted as twins in super-imposed turrets on the center line, two turrets being on the forward deck and two on the after deck. There are 15 inches of armor on the turrets and 12 inches on the barbettes. The guns have a greater elevation than those provided for earlier ships. Each twin-gun position is self-contained in the vitally important matter of range taking and fire control, and in the event of the main direction station being put out of action, each pair of guns could still be aimed and controlled within the limits of vision imposed by their restricted height above the water. Each turret contains its own range finder. Besides the turret range finders there are others in the fire control position above the conning-tower and in the mast station.

The secondary battery consists of twelve 5-inch quick-firing guns using an armor-piercing projectile of 82 pounds and having a range of 12,000 yards. These guns are mounted in a casemate protected by a 5-inch gun shield. The *Engineer* makes the following criticism: "Five guns on each side are disposed in an open battery on the forecastle deck, the remaining two weapons being mounted a deck higher and abreast of the forward tunnel. Beyond a 5-inch shield these guns do not appear to have any protection, and although their high command would probably enable them to be fought with effect in any weather, this advantage is largely counterbalanced by their exposed position. In our view the absence of proper armor protection to the quick-firing battery seriously detracts from the merit of the design as a whole. If it were deemed worth while to fit such an armament at all, it would surely have been more logical to provide some safeguard against the contingency of all these guns being placed *hors de combat* by the first salvo—a fate to which, in their present undefended situation, they are clearly exposed."

The main armor belt on the sides of the *Hood* has a maximum thickness of 12 inches and is sufficiently deep to protect the water-line through all conditions of draft. The belt towards the bow tapers to five inches and aft to six inches. The protective deck armor varies from one to three inches; the forecastle deck is two inches amidships, the main deck, one and one-half inches on the flat and two inches on the slopes; and lower deck in this part of the ship is about two inches. An essential feature of hull protection of the *Hood* against mines and torpedoes is an improved bulge or "blister" along her underwater body, and this with an improved system of bulkhead subdivisions it is estimated would make it necessary for the *Hood* to be hit by several torpedoes before she would sink. The bulge or blister provided for the *Hood* is the invention of Sir Eustace d'Eyncourt and was used on a number of British warships, proving its worth, for when hit by torpedoes the ships remained afloat.

The keel of the *Hood* was laid September 1, 1916, and she was launched August 22, 1918. She had originally three sister ships, the *Anson*, *Howe* and *Rodney*, which were authorized to be built at the same time. The work on the three latter ships, however, was discontinued for reasons of economy when the armistice was signed; and the *Hood*, which has been designated as the flagship of the British Atlantic fleet, is the only one completed of the four monster warships originally authorized.—*Army and Navy Journal*, Dec. 27, 1919.

NAVY ESTIMATES.—It is gratifying once more to have the "Navy Estimates" in the well-known form, but it is quite impossible to make any comparison, since the period they cover, ending March next, can scarcely be termed "normal." The total sum involved is 157,528,800*l.*, an increase on the forecast of 149,200,000*l.*, largely due to increased pay, pensions and

war gratuities. The total, however, is very favorable compared with the expenditure during the war, when the weekly rate of expenditure reached a maximum of 6,750,000*l.*, immediately prior to the armistice; this was at the rate of more than 350,000,000*l.*, a year. The total for the years of war is now stated to be as follows:

| | | |
|---|---|---|
| 1915-16 | (net) | £205,733,597 |
| 1916-17 | (net) | 209,877,218 |
| 1917-18 | (net) | 227,388,891 |
| 1918-19 | (estimated) | 325,000,000 |

There is every probability of a reduction in the near future, as there has been a great diminution in the number of ships built. An interesting table given in the First Lord's statement has reference to the revision in the shipbuilding programme.

*Revision of Shipbuilding Programme.*—Of the vessels under construction at the time of the armistice, those were completed whose construction had proceeded so far that cancellation would have been uneconomical having regard to the possibility of their useful employment upon naval and other work. The following table shows the numbers involved and their disposal according to their various classes:

| Type | Ordered and under construction 11. 11. 18 | Since cancelled | Completed 31. 10. 19. | To be completed |
|---|---|---|---|---|
| Battle cruisers | 4 | 3 | .. | 1 |
| Light cruisers | 21 | 4 | 8 | 9 |
| Flotilla leaders | 11 | 4 | 8 | 3 |
| Destroyers | 97 | 40 | 41 | 16 |
| Patrol boats | 1 | .. | 1 | .. |
| Submarines | 73 | 33 | 20 | 20 |
| Aircraft carriers | 2 | .. | .. | 2 |
| Minelayers | 2 | 2 | .. | .. |
| Twin screw mine sweepers | 99 | 36 | 57§ | 6 |
| Paddle mine sweepers | 5 | 5 | .. | .. |
| Patrol gunboats | 56 | 31 | 24 | 1 |
| Trawlers | 259 | 215* | 44 | .. |
| Drifters | 206 | 173† | 31 | 2 |
| Boom defense vessels | 29 | 1 | 26 | 2 |
| Tugs | 99 | 43‡ | 47 | 9 |
| Seaplane towing lighters | 23 | 19 | 4 | .. |
| "24" Class | 11 | 2 | 8 | 1 |
| Mooring vessels (excluding motor boats) | 7 | .. | 4 | 3 |
| Totals | 1005 | 611 | 319 | 75 |

* Including 133 building cancelled for the navy but completed for private use.

† Including 109 building cancelled for the navy but completed for private use.

‡ Including 25 building cancelled for the navy but completed for private use.

§ Including 6 completed as surveying vessels.

*Disposal of Ships and Stores.*—The following statement gives the number of ships sold by the Admiralty since the armistice up to November 24, 1919, including obsolete warships sold for breaking up:

| | |
|---|---|
| Battleships | 2 |
| Cruisers | 2 |
| Destroyers | 42 |
| Torpedo boats | 22 |
| Gunboats | 7 |
| Submarines | 11 |
| Sloops | 2 |
| Whalers | 5 |
| Yachts | 8 |
| Motor boats | 3 |
| Motor launches | 67 |
| Tugs | 3 |
| Trawlers | 167 |
| Drifters | 39 |
| Miscellaneous | 11 |
| German submarines (sold on Allied account) | 56 |

In addition, considerable quantities of material as part of the liquidations of contracts have been dealt with.

Numbers of small craft and large "arisings" from dockyards, ships and local depots all over the country have been sold by arrangement with the Disposals Board, to whom the proceeds of the sale will accrue.

A useful feature of the "Navy Estimates" was formerly, and is still, the dimensions of the ships built, but in view of the comprehensive paper read by Sir Eustace d'Eyncourt before the Institution of Naval Architects, and reproduced in *Engineering* (vol. cvii, pages 479, 482), it is not necessary here to deal with the particulars given. The only exception is the case of the battle-cruiser *Hood*, which is now being completed at Messrs. John Brown and Company's yard at Clydebank. This vessel was not included in Sir Eustace d'Eyncourt's paper, and the dimensions are therefore given here for the first time. She is the largest warship so far completed, her length being 860 feet, her beam 104 feet, and her mean load draft 28 feet 6 inches, at which the displacement is 41,200 tons. The geared turbine machinery with which she is fitted develops 144,000 shaft horse-power, and the designed speed is 31 knots. Oil fuel is used exclusively, and the capacity at load draft for this fuel is 4000 tons. Her armament includes eight 15-inch guns, twelve 5.5-inch guns, and four 5-inch anti-aircraft guns. The total estimated cost as revised, including the guns, is 5,458,335*l.*, the estimated cost of the guns alone being 171,000*l.*; this, of course, does not include the mountings. It is anticipated that more than 5,250,000*l.* of the estimated cost will have been spent by the end of March next.—*Engineering*, Dec. 12, 1919.

NAVY ESTIMATES ANALYZED.—By a Sea Officer.—The revised navy estimates issued last week have a double interest. Issued as late as they are in the year they indicate rather more the amount of money which has been spent during the financial year than the amount estimated for the twelve months' expenditure. They afford, therefore, an indication of the extent to which an avowed policy of retrenchment has materialized and in this respect they cannot fail to be considered somewhat disappointing. They show that during the year the saving anticipated in March has not been realized, and on the other hand additional charges have had to be borne by the navy votes. Thus instead of a decline from the figure of £149,200,000 forecasted in March last, there is a net increase in the figures now presented of £8,328,000. The largest item of increase is the £10,400,000 for additional pay and pensions for the officers and men of the fleet, which nobody in the country will grudge, but what is surprising is that since the

Jerram and Halsey committees were appointed much earlier in the year and it was perfectly obvious that their recommendations would mean increased expenditure, no adequate measures were taken to save the money on other votes.

It is often said in extenuation of the large sums which have been spent on the navy this year that the purchasing power of the pound sterling is now less than half what it was before the war. But this is not really any excuse, at all events for the government, which should aim at making the pound go farther, and not meekly accept the existing conditions as normal. We are also asked to consider this total of over £150,000,000 as equivalent to a pre-war figure of £75,000,000, with the suggestion that we are thus getting back to ante-bellum conditions, when the estimates were at a maximum of about £50,000,000. But this acceptance of the latter figure as a standard is altogether wrong. In those days we were building and maintaining a fleet 60 per cent superior to that of Germany, which power possessed the second strongest fleet in the world, and we were virtually hovering on the verge of war all the time. To-day the conditions are completely changed. There is no nation with a fleet anywhere near the strength and efficiency of our own which is not only friendly but either allied to or associated with us. Moreover, not only is this the case, but the whole question of what the material of the future navy shall consist is undetermined and must remain for some time a matter of research and experiment. It is unquestionable, therefore, that an effort should be made to reduce next year's estimates to the sum of $60,000,000, which was suggested by the Chancellor of the Exchequer as that at which it should be fixed in a normal year, and if the purchasing value of the sovereign appreciates then a still further reduction should follow.

The figures of the estimates again emphasize what a wide influence on expenditure is exerted by the numbers of officers and men. Mr. Chamberlain estimated on Oct. 29 that the total borne would be reduced by demobilization and the ordinary processes of wastage to 146,000. How far this forecast is likely to be realized is not indicated by the new estimates, which are dated Oct. 31, or only two days after the Chancellor of the Exchequer spoke. But what is shown is that the actual number borne on April 1, 1919, was about 275,000, which accounts in a measure for the large sums taken for those votes which rise and fall automatically with the numbers required for the fleet. It will not be until the latter are brought down to the strength mentioned by Mr. Chamberlain that these votes will show a decrease, and in this direction the value of the accumulated stocks of provisions, etc., should also have its effect. So far as the votes for construction are concerned, the heavy expenditure under these is admittedly due to war commitments. This does not apply, however, to several large sums for repairs to ships the fighting value of which is now only questionable. Under the miscellaneous vote several interesting items appear, including a sum of £80,000 for the issue of medals to officers and men.

It has been said that the estimates have a double interest, and this is due to the issue with them as an appendix of a statement showing the expenditure on the respective navy votes during the war. Here for the first time it is possible to trace the cost of the sea services year by year during hostilities. The first thing to strike the examiner of this document is how extraordinarily economical, comparatively speaking, is the naval weapon. In the heaviest year of war expenditure, it only cost an average sum of £890,539 a day, or less than one-eighth the total daily cost of the war to us. Naturally, there were continuous progressive increases in the votes for wages, victualling and medical services all through the war. So, too, the vote for civilians employed upon fleet services rose gradually from £176,977 to £622,300, and in this connection the sum of £496,000 asked for in the present year seems abnormally high. The educational vote differs from others in that, while it increased only slightly in the war, it has now

been doubled, one-third of the increase being absorbed by the University course at Cambridge. Any complete analysis of the shipbuilding and works votes would require an article in itself. Both these votes attained their maximum when Sir Eric Geddes was First Lord, as did the cost of the Admiralty office, which increased by one-third. Apparently the only item in the estimates which has remained stationary all through the war is the sub-head under Vote 14, which provides for pensions to retired naval officers.—*The Army and Navy Gazette*, Dec. 13, 1919.

REDUCING THE FLEET.—It would be more interesting than profitable to speculate as to the composition of the navy list twelve months hence, so far as ships are concerned. So many vessels have been removed since the armistice, and so many are awaiting condemnation, that it is scarcely possible to say at a given moment how many effective units of each type we still possess. In the case of armored ships all battleships of the pre-dreadnaught type, excepting the *Lord Nelson* and *Agamemnon*, have been removed from the list, and it is considered most probable that the same fate will shortly befall the earlier dreadnaughts, such as the nameship herself, the three *Bellerophons*, the two *St. Vincents*, and the *Neptune*, *Colossus*, and *Hercules*. Certain of these vessels are still employed on subsidiary service, *e. g.*, the *Téméraire*, which is now cruising as a school ship for cadets, but most of them are in charge of care and maintenance parties, which is the halfway-house to the scrap heap. The *Indomitable*, which was one of our earliest battle-cruisers, has already been placed on the sale list, and her sister, *Inflexible*, is expected to follow early in the coming year. Only ten years ago these two vessels, together with the ill-fated *Invincible*, formed a squadron which in speed, gun power, and homogeneity was unrivaled. Apart from the trouble experienced with the gun mountings of *Invincible*, which were worked by electricity, the ships were completely successful, and all proved magnificent steamers. In 1908, it will be remembered, the *Indomitable*, with our present King on board, made the Transatlantic passage at an average speed of 25 knots, without any forcing of the machinery. As fighting ships they were somewhat deficient in protection, having only 6-inch armor on the water line—not 7-inch, as given in the text-books—and very meagre horizontal plating. At Jutland the *Invincible* was destroyed by a German shell which struck the roof of a 12-inch gun-house, the flash of the explosion penetrating, it is supposed, to the magazine below. A drastic sweep is to be made of all light cruisers down to and including the *Boadicea* class, though the last unit of this class was completed only six years ago. The fact that such comparatively new ships should be discarded emphasizes the government's determination to curtail naval expenditure. As we are now well supplied with fast light cruisers the loss will not be severely felt, but it is impossible not to regret the premature disappearance of so much valuable material. Among the many destroyers on the sale list are the remaining *Tribals*. Originally there were twelve boats in this —"F"—class. At the outbreak of war, as the sixth flotilla, they were attached to the Dover Patrol, in which they performed magnificent service and suffered heavy loss through torpedoes and mines. Submarines of every class are going in batches to the shipbreaker. Most of the B, C, D, and E boats have disappeared or are about to do so, and several of the large steam-driven K boats have been paid off for disposal. Apparently their steam machinery is held to disqualify them for inclusion in the fleet of the future, but in all other respects they are thoroughly up-to-date, and no other power possesses submersible vessels equal to them in size, speed, and general fighting power. It appears that the "H" and "R" classes are to be removed *en bloc*, since it is officially notified that their reserves of spare parts, etc., are not to be renewed. The H boats were of American design, and the first group of them, ordered in 1914 by Lord Fisher, were completed very quickly and crossed to Europe in the following year under

their own power. They displace only 467 tons when submerged and have a surface speed of 13 knots. Four were lost during the war, one being irreparably damaged by an Austrian air bomb while it lay in dry dock at Venice. The "R" class boats were built for the special purpose of destroying hostile submarines. They are quite small and very uncomfortable to live in, but the armament of six torpedo tubes and the remarkably high speed of 15 knots below water would have made them formidable antagonists to any U boat. As, however, they were not finished until shortly before the armistice they had few opportunities of showing what they could do.—*Engineering*, Nov. 28, 1919.

CASUALTIES AT JUTLAND.—Now that an authoritative list has been published of the casualties in the Battle of Jutland it is possible to form a clearer idea of the extent to which the various sections of the Grand Fleet were engaged. As was to be expected, the losses were heaviest in Admiral Beatty's command, which bore the brunt of the combat. Of the six battle-cruisers with his flag, two, the *Queen Mary* and *Indefatigable*, were sunk outright, the loss of life in these ships being 1258 and 1017 respectively. There were no survivors from the *Indefatigable*, and only six from the *Queen Mary*. The *Lion*, which, as Admiral Beatty's flagship, naturally attracted a large share of the enemy's fire, suffered rather severely, losing 95 killed and 51 wounded out of her total complement of 1229, the casualties thus representing 11.87 per cent. The *Princess Royal* had 19 killed and 81 wounded, or 100 casualties in all, being 8.31 per cent of her complement of 1202. The *Tiger*, which had 1281 officers and men on board, escaped more lightly, losing 20 killed and 46 wounded, or 5.15 per cent. Singularly enough, no one was killed or wounded in the *New Zealand*, which as Rear Admiral Pakenham's flagship was hotly engaged. The Fifth Battle Squadron—*Queen Elizabeths*—which was supporting the battle-cruiser fleet, was roughly handled at times, as its losses testify. The *Malaya* suffered most, losing 33 killed and 68 wounded, or 9.78 per cent. Many of these casualties resulted from a cordite fire which broke out in the 6-inch battery. Everyone has heard of the *Warspite's* involuntary dash at the enemy, when her steering gear jambed. During this period she was under a tornado of fire at close range, but escaped serious damage and had only 9 killed and 32 wounded. The *Barham*, flagship of Admiral Evan-Thomas, had 22 killed and 46 wounded. There is little doubt that the robust protection of these battleships saved them from grave injury and limited their casualties. In proportion to complement the light cruisers suffered heavy losses. Thus the *Chester* had 29 killed and 49 wounded out of a company, of 424, which was 18.39 per cent. The *Southampton* with a larger complement, fared badly too, losing 29 killed and 60 wounded, or 17.87 per cent. The grim distinction of having the largest percentage of casualties—apart from ships that sank—belongs to the *Broke* flotilla leader. Two hundred officers and men were crowded into this small vessel—1704 tons—of whom 47 were killed and 36 wounded, a percentage of 41.50. As leader of the second half flotilla the *Broke* took part in the night torpedo attacks on the retreating enemy and came under point-blank fire. The only ship in the Battle Fleet proper which sustained any casualties from gun fire was the *Colossus*. This battleship was straddled at long range and had nine men wounded. The immunity enjoyed by the Battle Fleet, whose fire is known to have inflicted very heavy losses upon the enemy, shows how completely the German *morale* had collapsed in the concluding stages of the action. Approximately 60,000 officers and men were serving in the Grand Fleet at Jutland, and our total casualties were 6688, *i. e.*, 6014 killed and 674 wounded. In no previous naval action recorded by history was the proportion of killed to wounded so enormous, but the causes of this disparity are too obvious to require explanation. Taking our Jutland casualties as a whole, we find that they represented 11.14 per cent of the force engaged. The corre-

sponding figure at Trafalgar was 9.51, at Camperdown 10.03, and at the Nile 11.22. But as in none of these battles did the actual mortality come within measurable distance of the rate at Jutland, we are justified in concluding that naval warfare of the present age is far more deadly than it was in the days of old.—*Engineering*, Nov 28, 1919.

THE FUTURE OF NAVIES.—It was very natural that in the recent discussion on the navy estimates the point should have been made that we have no longer to build up to a two-power standard, a two-keels to one standard, or a ratio of 60 per cent over the next strongest power, as the only two nations of the world which have at present navies approaching our own in strength are those of our Allies and friends. This is not a reason why we should not keep in touch with what these powers are doing in regard to naval construction, if only to measure their idea of the value of the proposed League of Nations. The General Board of the United States Navy, unless something definite is done towards the international limitation of armaments, advocates a navy "ultimately equal to the most powerful maintained by any other nation in the world," and recommends a building programme calculated to bring this about by 1925. It remains to be seen what view the American Congress will take of this proposal. As regards Japan the latest information is that estimates are to be submitted to the next session of the Diet for a programme of two 40,000 ton battle-cruisers, 3 light cruisers, 6 destroyers, 12 submarines and 3 river gunboats, to be completed by 1923. In both countries it would seem that the naval authorities have come to the conclusion that it is unwise to let go of a certainty for an uncertainty. Whatever may be our own policy—and Mr. Long says that it is not yet determined—there are several British admirals who, to judge by their published views, must be in accord with the opinions of the United States Naval Secretary and the Japanese Minister of Marine. That many other people regard the future of navies from a similar standpoint is clear from the recent discussions in the House of Commons. Disappointing as it may be to those who pin their faith to the League of Nations, the preponderance of opinion still seems to be that for a country's defence warships are more efficient than scraps of paper.—*The Army and Navy Gazette*, Dec. 27, 1919.

THE BALANCE OF POWER AGAIN.—To those who desire Britain to be strong it is a matter for satisfaction that she is returning to her traditional policy, whose central doctrine is the balance of power. To the sentimentalists it is anathema. Why, it would be difficult to say, unless they consider that nothing more substantial than illusions and vague ideals is worthy of consideration. What one would like to point out to them is that whenever they have Britain's ear national interests are jeopardized, and a weak or distracted country, perhaps several, suffers; whenever she is pursuing vigorously the course marked out for her higher position in Europe she stands ever for justice and freedom. Or, to put it another way, in the one case she follows ease, however brilliantly decked out in the garments of idealism, in the other she follows duty at whatever sacrifice. It was not as a nation governed by pacifist ideas that, at intervals from Louis XIV to the German Kaiser, she saved the world, but as the great fighting champion of the balance of power.

In the universal joy at the conslusion of the armistice the abstract school of thought came to the front again, which would have been impossible only that the United States was represented by one of them in the person of President Wilson. He said that she would not fight for the balance of power, although she had entered the war in defence of the doctrine when it applied to herself, for when the European equilibrium is entirely upset the equilibrium of the world is threatened, as it was in the Great War. What President Wilson meant was that America would not fight for the balance of power in Europe unless other continents were

involved, a perfectly intelligible proposition, but one which we could not have made clear to British and French statesmen. Otherwise they would not have allowed him to persuade them to substitute the League of Nations for the balance of power as the governing principle of the Peace Treaty. The results of their acquiescence in his dictation are: (1) That the United States, whose membership of the League was essential to its establishment, drops out; (2) that the sacrifices made by the Allies in Europe to implement in it are vain; (3) that Russia and the new states born of the war have not received the aid they would have done had the balance of power been respected at the Versailles conference; (4) that Britain, by her support of the League and pursuit of an American alliance, has endangered her European friendships necessary to the maintenance of the balance of power.

But if England, France and Italy take the lesson to heart the attempt to put the nations in a strait jacket in the name of peace will have cleared the air of the intellectual miasma from which it has been suffering. The alternative to the balance of power has been tried and found to be a fantastic dream or, at best, an ideal with no practical application now or in the near future. Therefore the leading principle of European policy, which has never yet been abandoned without disaster, is paramount again. The League and the fourteen points, which were to re-create the world of themselves, are to be shelved, and the pressing problems in the Near East, in Central Europe, the Adriatic and in Russia solved by sustained effort, and, if need be, by military pressure. England as the depository of the balance of power is playing her historic part, and, as the predominant partner in the new Triple Alliance, will probably do more to promote the peace of the world than she ever would as a partner in a nebulous League of Nations. But with her return to the doctrine by which she became great she will require to reconsider her policy with regard to the army and navy. All talk of disarmament in high places must cease, since both will have to be maintained so as adequately to discharge with France and Italy the heavy responsibilities entailed by a Europe, half of which is in a state of anarchy, and menaced by a Germany seeking revenge.—*The Army and Navy Gazette*, Dec. 27, 1919.

THE NAVAL OFFICER'S FUTURE.—The Admiralty are wisely taking time by the forelock in acquainting young naval officers with details concerning openings for careers in other walks of life. Not long ago regulations for the transfer of Midshipmen to the Air Force College were promulgated; particulars of service under the Indian and Colonial authorities have been given; vacancies in the Royal Australian Navy are advertised from time to time; and now it is notified that appointments in the Civil Service under the reconstruction scheme afford a suitable opportunity for a number of officers to change their career. All these are symptoms of the great changes which are necessary in connection with the cutting down of the lists of officers to their normal size. How far the reductions will go is not yet clear, because they must be dependent upon the naval policy of the government, which is not yet defined. It can hardly be doubted that in the economies now being effected the board have looked up the experience of the reductions made by Mr. Childers half a century ago. As a result of those changes a large number of younger officers left the service, whereas it would have been far better for the navy if the older ones had gone instead; and within a few years, when expansion was forced upon us again, it was necessary to resort to the expedient of supplementary lieutenants from the Mercantile Marine to make good our deficiency. As regards the present situation, the fullest possible light should be thrown upon the government's intentions, so that officers can have the best guidance in determining their future. The service is anxiously awaiting the outcome of the various schemes for retrenchment, and the withholding of full information would certainly react upon its

zeal and efficiency. The navy has full confidence that Lord Beatty will see that reductions are carried out in a spirit of justice, but it may further be hoped that the government will deal generously with officers who well deserve the best that can be done for them.—*The Army and Navy Gazette*, Nov. 29, 1919.

A LAMENTABLE TALE OF ERROR.—The final report of the Government Commission dealing with the origin and inception of the Gallipoli Expedition has at last been issued. The main conclusions of the findings of the commission may be briefly stated. From the outset the risks of failure outweighed the chance of success. The conditions of the problem were not fully investigated, and there was no correct appreciation of the nature and difficulties of the enterprize, which were under-estimated. Success was possible only on condition that the government concentrated on the enterprize and limited their efforts on the Western Front. This condition was never fulfilled. Undue delay in deciding on the future course of the operations followed the failure of the first attacks. The plan of attack from Anzac and Suvla was open to criticism, the failure to press the attack on Suvla is attributed to a want of determination and competence in the divisional commander and one of his brigadiers. It would have been well if, after the first landings, Sir Ian Hamilton had examined the situation in a more critical spirit, and submitted to the Secretary of State for War, arguments for and against continuing the operations. The decision to evacuate was right, and should have been acted on immediately, Sir Charles Munro's advice had been confirmed by Lord Kitchener. The operations were hampered throughout by the failure to supply sufficient artillery and munitions and to keep the force up to strength. Many minor frontal attacks were made without sufficient artillery preparation, and entailed unnecessary loss of life. Through lack of organization and provision there was a serious lack of water for the troops at Anzac and Suvla. Medical arrangements were defective and insufficient, especially the provision for the evacuation of the wounded. Now this is all ancient history. Most people who followed the course of events during the years of the war, would naturally draw the same conclusions as those arrived at by the commission. But it is worth while here to note Sir Thomas MacKenzie's remarks in his supplementary report. He attacks the War Office in no measured terms. He says, "The Cabinet having determined upon amphibious operations against Constantinople, necessarily left the preparations for and conduct of the military attack to the War Department. That system seems to be at fault which permitted—the outbreak of war to find the Imperial General Staff unprepared for operations against the Dardanelles and the Bosphorus—always of vital strategic interest for the British Empire in the East; the General Staff to allow Sir Ian Hamilton to proceed to the Mediterranean without either a worked out plan of attack or such primary requirements as verified or complete maps of the peninsula; and the General Staff, cognizant of the difficulties and lack of preparation, acquiescing silently in this state of affairs." To this breakdown of the War Office system on the testing ground of war may be traced some of the vital factors of the Gallipoli disaster. It is indeed lamentable to read that Sir Ian Hamilton admitted to Field Marshal Lord Nicholson that lives were used instead of shells. He said, "The vital thing was to make good, and to make good we ought to have had ample artillery, especially howitzers. We had not, and there was nothing for it but to try and get on by sacrifice of human life." The whole report is the most sorry reading. We can only hope that in the event of the nation being engaged in another war, no force will be allowed to take the field in which lives will have to be sacrificed instead of shells. But what the public wants to know—especially those who lost sons or husbands in the disastrous campaign—is who was responsible for the defects and what punishment is to be meted out to the culprits?—*United Service Gazette*, Nov. 27, 1919.

THE POST-BELLUM ARMY.—Just now it is not surprising to find on all sides that the predominant factor in the reorganization of the army is the question of finance. Formerly somewhere about thirty millions was the sum apportioned to the Secretary of State for War with which he had to do the best he could. At the present moment it is obvious that to maintain an army even on the same pre-war footing, considerably more than twice that amount would be required. According to one forecast the regular army will be reconstituted on its old footing, but battalions will be relegated to establishments of about 600 strong instead of the former war strength of 1000 men to a battalion. In this way an economy in pay and upkeep will be effected. The public, having pinned their faith to the League of Nations as a guarantee of universal peace, are apathetic on questions of army expenditure, and disinclined to approve of large sums being voted for this purpose. The army estimates, of course, were issued last week, but even Sir Charles Harris, the Assistant Financial Secretary at the War Office, deemed it advisable to warn the public that accurate estimates at the present time are not possible.

Our readers must be well aware of our own distrust of, though by no means ill-will towards, the League of Nations. But we are not influenced by our personal views when we say that we at least question the accuracy of the assertion that the public has pinned its faith upon it as a guarantee of permanent and universal peace. Meanwhile, it is, naturally, with the future organization and distribution of our army that we are most concerned, and as regards the former, it is generally agreed that the method of providing officers is one of quite the most important details. On this point a scheme drafted by Captain Loseby deserves special attention. It points out that the late war has demonstrated that the present system produced a body of officers who, in the matter of technical skill, sympathy with the rank and file, and soldierly qualities were never excelled. This system, Captain Loseby thinks, should be retained in the majority of cases. Nevertheless (especially in view of the activities of a certain section of politicians) it is advisable, that the advantages of the present academic training should be made more accessible to poor students. It is therefore suggested that annual vacancies might in future be allotted—as to 60 per cent to Sandhurst and Woolwich cadets, 20 per cent graduates of Oxford and Cambridge, and commissioned ranks of the territorial force, and 20 per cent candidates from the ranks of the regular army. The two last named classes, the scheme proposes, should pass through cadet schools identical in character with Sandhurst and Woolwich, except that they would be free, with adequate maintenance grants for candidates from the ranks. As to these it is further suggested that every battalion should have a school to provide the necessary preliminary education presided over and staffed mainly by officers.

Commenting on some of these proposals Major-General Sir Frederick Maurice says that the experience of the war has shown that a great number of officers who have done the best service, are men who have been promoted from the ranks. The most notable case of all is that of Sir William Robertson, who started as a private in the 16th Lancers, and became Chief of the Imperial General Staff during the war. A very large number of officers who earned great distinction in the field began their service as privates in the ranks, and quite a good proportion of these men are staying on in the army. The public do not, apparently, realize how very large is this proportion in the army to-day of officers who have been promoted from the ranks. It is certainly very striking in the case of the infantry of the line. In a battalion of regular infantry which has just been reconstituted, of twenty-two officers there are only eight of the old regular army, the remaining fourteen having all been promoted from the ranks. And that is by no means an exceptional case. In the Royal Artillery, at this moment, about 70 per cent of the officers below the rank of major, it is believed, have earned their commissions from the ranks.

The position, however, at the present time makes it impossible to allocate any definite percentage of commissions to men from the ranks, because owing to demobilization and the reduction of the strength of the army there is a large number of officers who have distinguished themselves in the war and have shown great capacity in their positions who are anxious to continue their service and for whom there is no room. We have, as a matter of fact, a surplus of several thousand officers, and therefore, of course it would be extremely difficult, if not impossible to apply any normal procedure.

This bears out an opinion that we expressed in these columns in the early days of demobilzation, when the authorities seem to have been guilty of no inconsiderable mismanagement. For while a large number of officers and men who had no desire for aught but to be relieved from military service forever as soon as possible, were unnecessarily retained, a number of young officers who had proved themselves valuable and were anxious to be placed on the permanent list, were compulsorily demobilized with remarkable celerity. We admit that there are many difficulties with which to contend, and only a few days ago a deputation waited on Mr. Winston Churchill to support the scheme drafted by Captain Loseby, especially as regards the proposal that in future a definite number of commissions in the regular army should be assigned to men serving in the ranks. In reply, Mr. Churchill reminded the deputation that he was himself responsible for the innovation in the Admiralty whereby promotion from the lower deck was facilitated. He was entirely sympathetic with the views expressed by the deputation, but wished to point out that there were at the present time 4000 officers surplus to establishment and 3000 clamoring for commissioned rank. The vast proportion of these were officers who had served in the ranks. He was strongly of opinion that the claims of these officers, who had risked life and limb for their country, were superior to those of young boys who had not seen service. In regard to the future, he was of opinion that a certain number of places should be definitely assigned to serving soldiers. He accepted that principle absolutely. He was also of opinion that the whole system of promotion from the ranks should be improved. He believed further that steps should be taken to train scientifically and methodically the young soldier for the position to which he aspired. In conclusion, he assured the deputation that they "might confidently expect ameliorative reform."—*United Service Gazette*, Dec. 18, 1919.

ARM CHAIRS FOR MEN OF BRITISH NAVY.—A new luxury is to be supplied to enlisted men in the British Navy in the shape of cozy arm chairs, which the Admiralty announces, according to London press dispatches, are to be supplied to battleships and cruisers for the comfort of men when off watch.—*Army and Navy Journal*, Dec. 13, 1919.

## JAPAN

JAPAN PLANNING A BIGGER NAVY.—It may seem strange to foreigners that Japan, a member of the League of Nations, should have a new naval-building scheme under way in view of the fact that the Covenant has been signed recognizing the necessity of a reduction of armaments. This admission is frankly made by the Tokyo *Jiji*, a progovernment organ, which assures the world that Japan's present naval program is not new, but dates back to a time shortly after the termination of the Russo-Japanese War. Then the scheme known as the "eight-and-eight fleet" (eight battleships and eight battle-cruisers) was recognized both by specialists and the nation as the minimum limit of Japan's naval equipment, and "if it had not been for political or financial obstacles the plan would have been completely carried into execution several years ago." This being so, the *Jiji* believes that Japan may even now alter her naval plans for an eight-and-six

fleet, which is actually in process of making, into an eight-and-eight fleet, without arousing suspicion or surprise in other powers, as it is the lowest armament "consistent with national safety, having special regard to the geographical situation and circumstances of this country." Japanese naval expansion, the Kobe *Japan Chronicle* reminds us, is always officially styled "naval replenishment," and in the bill which is to be one of the most important problems before the Imperial Diet, the plan proposed by naval authorities consists in building 215 vessels, including 4 battleships, 4 battle-cruisers, 20 cruisers, 82 torpedo-destroyers, 75 submarines, and 30 special service vessels. These are to be built in eight years (1920-1927) at a cost of 764,000,000 yen over and above the cost of the ship now under construction. Although some reduction will be made before the plan is submitted to the Diet, it is reported that an agreement of views has been arrived at between the military and naval authorities, despite their perennial rivalry for expansion and budget appropriations.

The *Jiji* gives these reasons for a bigger navy:

"In discussing the question of national defense, it has been usual to make calculations with some imaginary enemy in view. But now there are new factors which must have due weight in considering the question of naval armament. (1) Having undertaken a mandatary administration of the South Sea Islands, Japan has extensive areas north of the equator to keep guard over; and (2) now that the Japanese mercantile marine has developed so much that there is hardly any sea on which the flags of her merchant vessels are not in evidence, it is necessary to give adequate protection not only to those vessels, but also to the increased number of her nationals resident abroad as a result of the great expansion of her carrying trade. Here is good material for showing that the naval-supplement scheme of Japan can not lay her open to a charge of militarism or aggression."

*The Japan Chronicle* says such arguments are "unconscious quotation," for they are "identical with those used for the creation of the German Navy." Less confident in the prospect is the Tokyo *Yorodzu*, an opposition paper, which recalls that in the last session of the Diet the policy of the naval authorities was to have 16 battleships and eight battle-cruisers:

"This meant an addition of a squadron of eight battleships to the eight-and-eight fleet which had been the aim pursued by the navy so far. The scheme which is actually in progress is an eight-and-six fleet (including eight battleships and six battle-cruisers to be completed by the end of 1923), and for this purpose an appropriation of 480,000,000 yen to be spent in the course of 1920-1923 has already been approved by the Diet. It is said that a further sum of over 500,000,000 yen will be required for carrying out the proposed scheme for completing an eight-and-eight fleet in eight years from next fiscal year. This is a serious financial problem. But apart from the question of ways and means, there are two or three previous questions to be answered in connection with the scheme."

One of these questions is the restriction of armaments, the *Yorodzu* points out, and another is the ship-building capacity of Japan. But more important than either is the question of the type of vessels that are to be built, especially of the value of battle-cruisers, and this journal proceeds:

"Battle-cruisers are a sort of cross between battleships and torpedo-destroyers. They are no match for battleships in point of offensive and defensive power, and they are not up to torpedo-destroyers or light cruisers in point of speed. This weakness of battle-cruisers was exposed by the naval fight between Britain and Germany, and some people have already begun to doubt their utility. In order that Japan may complete the eight-and-six fleet by the end of 1923, as arranged, it will be necessary to build two more battle-cruisers; and if the eight-and-eight fleet scheme is to be carried out, it will be necessary to build four more. Since doubts are cast on the usefulness of this class of vessels, will it not be politic to remodel the scheme altogether on the basis of further technical inves-

tigations? This is not a matter to be lightly dismissed if one consider that it costs the large sum of 45,000,000 yen to build a battle-cruiser of 30,000 tons."

In the *Kokusai-ho Gwaiko Zasshi* ("Review of International Law and Diplomacy") Vice-Admiral Sakamoto writes that—

"Although it is true that one cannot expect much from the League of Nations, yet this much can be hoped of it, that the standards of armaments of the several powers will be fixed within such limits as they may agree to, and within such limits it will be possible to minimize the burden of armaments, if opportunity for armaments should be equalized, by limiting arms and, consequently, the cost of armaments by requiring, for instance, that the displacement of battleships should not exceed 20,000 tons, that the caliber of guns should be 12 inches at most, and so on."

Incidentally this Japanese vice admiral points out how steadily the naval expenditure of his country has been increasing as follows:

"The ratio of the annual average of naval expenditure for the ten years preceding 1918 to the total national expenditure was 14.8 per cent, but it bounded up to 18.2 per cent in 1918, and there was another advance to 23.6 per cent in 1919. There is no doubt that there will be a further increase in 1920 and the succeeding years. Such a high ratio has seldom been witnessed in the navies of other powers. Even the naval appropriations of Britain in 1914, when her navy was in a state of greatest tension, represented no more than 24.6 per cent of the total expenditure. And it is to be feared that this abnormal ratio attained to by the British naval budget in time of war will soon be reached in this country in time of peace, considering the rate at which the naval appropriations have increased here during the past ten years or so."—*Literary Digest*, Dec. 27, 1919.

THE RESTRICTION OF ARMAMENTS AND JAPAN.—No power seems to have decided upon any fixed policy with regard to the limitation of armaments. However, both the Japanese Navy and Army have been investigating the matter and have organized commissions to report upon it. The opinion of the Navy Department in regard to this question seems to be as follows:

As is recognized by every power Japan has a special position in the Far East. Consequently Japan is charged with the responsibility of preserving the peace of the Orient. Consequently Japan is justified in aiming at an eight battleship, eight battle-cruiser standard.

Although all European nations extended their armaments during the war, Japan has not even been able to carry out her eight and eight standard so far, and therefore it is impossible for her to reduce her present standard.

With this standard Japan has no aggressive purpose, but it is a minimum standard for carrying out her responsibility in the Far East and ensuring her self-defense. The Japanese Navy expects to participate in the conference in the League of Nations when this question will be brought up. Translation from *Jiji*, Nov. 19, 1919.

TRAINING SQUADRON STARTS ON CRUISE.—The training squadron, consisting of the *Adzuma* and the *Tokiwa*, under command of Vice Admiral Horiuchi, left Yokosuka for France on the 24th November. There were on board 115 naval cadets.

The route will be through the Indian Ocean and the Mediterranean Sea. The training squadron will return to Yokosuka May 23, 1920.

THE CESSION OF TSINGTAU TO JAPAN.—The effect in the future of the creation of another Japanese sphere of influence, similar to Manchuria, is realized by all who are intimately connected with China, but it is perhaps as well that it should be more generally known on account of its indirect adverse effect on British trade, for the most probable consequence of this cession will be the decline of the port of Tientsin, the great port of North China, in which British interest predominates.

To indicate this probability it is only necessary to contrast the harbor and other facilities in the two ports. Tientsin is situated 36 miles from the sea on the banks of a narrow and, in spite of all improvements, tortuous river which has a bar at its mouth. As a result of this, in the spring and autumn vessels exceeding 12-feet draft, and in May and June vessels drawing more than 14 feet, cannot reach Tientsin, but must, like all ocean-going vessels discharge at the bar into lighters. Further, on account of the narrow and winding waterway no vessels of over 300 feet length can proceed to Tientsin, but must also discharge into lighters. Lastly, from December to March in most years and certainly for at least two months of that period the port of Tientsin is closed by ice.

When this occurs it is necessary to divert the trade of the port to the harbor of Chinwangtao, which is connected by rail with Tientsin. This, of course, entails additional transhipment and a journey of 180 miles for all goods, on a railway which is already sufficiently congested by lack of rolling-stock, a fact not making for prompt delivery.

With regard to facilities for discharge of cargo, vessels can lie alongside, but there are no appliances for handling heavy cargo, nor is direct loading into railway trucks possible, as the only wharves on the railway side of the river are in private hands, with the result that cargo is stacked in the open if it is to be shipped by rail, as there appears to be little or no warehouse accommodation. All cargo is handled by coolie labor. Altogether there is about 7000 feet of wharfage for public use at Tientsin, while there are also wharves where cargo may discharge at the port of Tangku, about 27 miles below Tientsin. This port can be utilized when vessels cannot reach Tientsin either on account of ice or owing to excessive draft, but here again there is extra transhipment unless goods are sent by rail to the interior, for direct loading into cars is possible here. With regard to coaling vessels there is an unlimited supply of good coal here from the Kailan mines, situated about 80 miles distant. Coal is cheaper at Tangku than in any other port in China.

Railway facilities in Tientsin do not assist the transport problem for, as stated above, cargo must be unloaded by hand from the ship, then either warehoused or stacked in the open to wait until freight has been arranged when there is a further journey by road on hand carts hauled by coolies, or from 1 mile to 2 miles before reaching the railway. Once at the railway station, Tientsin is in an unequalled position as regards distribution by rail, for it lies at the parting of the ways for Peking, and thus the northern part of the district served by the Peking-Hankow Railway, and the lines serving the south and east, namely, the Tientsin-Pukow Railway serving the province of Shantung and the Peking-Mukden Railway serving Eastern Chili, a province of Manchuria. Further through Tientsin must pass at present all seaborne goods for Shansi Province and Western Mongolia, *via* Peking and the Peking-Kalgan Railway.

The net value of the total trade of Tientsin exceeded 30,000,000*l.* in 1917, the bulk of this being in the hands of British firms, who have been established in the port longer than those of any other nationality. The total foreign population, excluding Japanese, is about 3000, the majority of whom are British. Chinese population is estimated at 800,000. After Shanghai and Hong Kong, the port of Tientsin is the most important in China, and also one in which we are very largely interested from an investment point of view. Anything calculated to upset the existing order of things, such as deflection of trade routes, should be a matter of some concern. That this is possible the following short description of the facilities offered by the port of Tsingtau goes to show.

The port of Tsingtau lies roughly 400 miles by rail from Tientsin, and about 300 miles by sea, and is situated at the entrance to the enormous land-locked bay at Kiaochau, the entrance to which is not more than 1¾ miles wide. The port was occupied by Germany in November, 1897, fol-

lowing on the murder of two German missionaries by a Chinese mob, and the occupation was perpetuated shortly afterwards by a so-called lease for 99 years from China.

Germany did everything conceivable to develop the occupied territory, and also to exploit by every possible means the special rights acquired at the same time in the hinterland—the province of Shantung—with the result that the port of Tsingtau became a first-class naval base and, further, a considerable commercial port, with cargo-handling and other facilities infinitely superior to those at the port of Tientsin.—*Engineering*, Oct. 10, 1919.

SUBMARINE RAILWAY TUNNEL FOR JAPAN.—According to the Japanese press the government railways have decided to make a submarine railway tunnel under the Moji-Shimonoseki Straits, connecting the island of Kinshu with the main island.

At present the railway systems in Honshu and Kynshu are connected by ferry boats, but the completion of the tunnel will much improve the connection and also be of great military importance.

The surveying and other preliminary work, which will be begun during the current financial year, will, it is thought, take two years, thus enabling actual operations to be begun in the third year. The cost is estimated at 20,000,000 yen.—*Engineering and Industrial Management*, Nov. 27, 1919.

## UNITED STATES

### NAVAL POLICY

THE PEACE LEAGUE AND DISARMAMENT.—It is a matter of record that, following the armistice, these United States, as represented by their President, went to Europe to co-operate with their allies in arranging the terms of peace, and also to find some better means of settling future international disputes than by the ordeal of battle. Prominent among the provisions of the treaty was one for the mutual reduction of armaments, and notably of the huge fleets which the threat of an aggressive German naval policy had called into being.

It will be remembered that, during this same period, the Secretary of the Navy was urging the authorization by Congress of the construction of a fleet of some one hundred and fifty vessels, which was to be an exact duplicate of the powerful fleet we then had under construction. The cost of the additional fleet would have been about one billion dollars.

Our readers will remember that we drew attention to the flagrant inconsistency involved in our Naval Secretary's urging the United States to make an enormous increase in its own naval forces, at the very time when our President was entering the Peace Conference with a request that our European Allies make a sweeping reduction in their sea power. In the midst of the general bewilderment as to what it all meant, there was one clear-eyed American, for whom the enigma was no enigma. A few days before his death, on December 27 to be exact, Theodore Roosevelt (would that this great American were with us in these shameful days!) wrote a letter, which now lies before us, in which he said: "The proposal of Mr. Wilson to build a navy in rivalry to Great Britain, if made in good faith, would merely be to build a spite navy. But, if it was not made in good faith, it was made in order to bluff Lloyd George and the Englishmen, and force them to assent to some of President Wilson's Peace League and disarmament plans."

Be all that as it may, the sequence of events is illuminating; and it should provide all Americans who are jealous of the prestige and honor of their country with food for serious reflection. Europe, as we all know, listened to our President; accepted, in its essential principles, his plan; and, in so doing, swept aside practices and policies of their own which had the sanction of centuries behind them. And, as for naval retrenchment, they did not even wait for the conference. The signatures to the

## NAVY DEPARTMENT—BUREAU OF CONSTRUCTION AND REPAIR

### VESSELS UNDER CONSTRUCTION, UNITED STATES NAVY—DEGREE OF COMPLETION, AS REPORTED DECEMBER 31, 1919

| Type, number and name | Contractor | Per cent of completion | | | |
|---|---|---|---|---|---|
| | | Jan. 1, 1920 | | Dec. 1, 1919 | |
| | | Total | On ship | Total | On ship |
| ***Battleships*** | | | | | |
| 43 Tennessee | New York Navy Yard | 96. | 92 3 | 93.5 | 89.5 |
| 44 California | Mare Island Navy Yard | 87.2 | 80.7 | 84.1 | 77.3 |
| 45 Colorado | New York S. B. Cpn. | 40.2 | 23.3 | 37.1 | 20.6 |
| 46 Maryland | Newport News S. B. & D. D. Co. | 60. | 52.6 | 58. | 51.2 |
| 47 Washington | New York S. B. Cpn. | 38.9 | 22.2 | 36.1 | 19.3 |
| 48 West Virginia | Newport News S. B. & D. D. Co. | 27. | 4.2 | 27. | 3.2 |
| 49 South Dakota | New York Navy Yard | 5.6 | .4 | .... | .... |
| 50 Indiana | New York Navy Yard | 5.6 | .4 | .... | .... |
| 51 Montana | Mare Island Navy Yard | 3. | 0. | ... | .... |
| 52 North Carolina | Norfolk Navy Yard | 3.8 | .3 | .... | .... |
| 53 Iowa | Newport News S. B. & D. D. Co. | .... | .... | .... | .... |
| 54 Massachusetts | Beth. S. B. Cpn. (Fore River) | .... | .... | .... | .... |
| ***Battle Cruisers*** | | | | | |
| 1 Lexington | Beth. S. B. Cpn. (Fore River) | Preliminary modified plans and specifications furnished builders. Development of working plans in progress. Structural steel being ordered. | | | |
| 2 Constellation | Newport News S. B. & D. D. Co. | | | | |
| 3 Saratoga | New York S. B. Cpn. | | | | |
| 4 Ranger | Newport News S. B. & D. D. Co. | | | | |
| 5 Constitution | Phila. Navy Yard | | | | |
| 6 United States | Phila. Navy Yard | | | | |
| ***Scout Cruisers*** | | | | | |
| 4 | Todd D. D. & Const. Cpn. | 34. | 11.5 | 32.2 | 10.8 |
| 5 | Todd D. D. & Const. Cpn. | 32.1 | 9.3 | 30.1 | 9.1 |
| 6 | Todd D. D. & Const. Cpn. | 24. | 2. | 24. | 2. |
| 7 | Beth. S. B. Cpn. (Fore River) | 3.5 | 1.8 | 2.8 | 1.7 |
| 8 | Beth. S. B. Cpn. (Fore River) | 3.5 | 1.8 | 2.8 | 1 7 |
| 9 | Wm. Cramp & Sons Co. | 23. | .... | 20. | .... |
| 10 | Wm. Cramp & Sons Co. | 22. | .... | 20. | .... |
| 11 | Wm. Cramp & Sons Co. | 8. | .... | 7. | .... |
| 12 | Wm. Cramp & Sons Co. | 8. | .... | 7. | .... |
| 13 | Wm. Cramp & Sons Co. | 8. | .... | 7. | .... |
| ***Miscellaneous*** | | | | | |
| Fuel Ship No. 17, Neches | Boston Navy Yard | 48.3 | 41.7 | 42.7 | 35.1 |
| Fuel Ship No. 18, Pecos | Boston Navy Yard | 19.2 | 3.1 | 17.9 | .8 |
| Gunboat No. 21, Asheville | Charleston Navy Yard | 94.5 | 92.5 | 93. | 90. |
| Gunboat No. 22, Asheville | Charleston Navy Yard | 11.8 | 9.8 | 8.9 | 6.9 |
| Hospital Ship No. 1, Relief | Phila. Navy Yard | 66.5 | 62.5 | 61.5 | 57.5 |
| Amm. Ship No. 1, Pyro | Puget Sound Navy Yard | 99. | 97.5 | 98.5 | 97. |
| Amm. Ship No. 2, Nitro | Puget Sound Navy Yard | 85. | 74. | 76. | 62. |
| Rep. Ship No. 1, Medusa | Puget Sound Navy Yard | 16. | 0. | 14. | 0. |
| Destroyer Tender No. 3, Dobbin | Phila. Navy Yard | 10. | 5.2 | 7. | 3.2 |
| Dest. Tender No. 4, Whitney | Boston Navy Yard | 0. | 0. | .... | .... |
| Sub. Tender No. 3, Holland | Puget Sound Navy Yard | 0. | 0. | .... | .... |

There are 109 destroyers, 52 submarines, 1 minesweeper, 9 seagoing tugs, 5 harbor tugs and 7 oil tankers in various stages of completion.

There were completed and delivered to the Navy Department during the month of December 9 destroyers, 1 submarine, 2 minesweepers, 1 seagoing tug and 2 harbor tugs.

There are in addition 12 destroyers and 10 submarines authorized but not under construction or contract. Miscellaneous vessels authorized but not under construction on contract one: Transport No. 2.

armistice were scarcely dry before France and Italy made semi-official announcement that they would undertake or prosecute no battleship construction. As for Great Britain, she put in the pruning knife with a ruthless hand, stopping all battleship construction, and scrapping no less than 156 warships, including many that were on the ways and partially built, three of them being sisters to the 42,000-ton *Hood*. This wholesale disarmament included the scrapping of every one of her pre-dreadnought battleships, some thirty in all, the latest of which are comparable to our own *Connecticut* and *Louisiana*, and all of her armored cruisers. And the end is not yet; for according to the latest advices, she has condemned her earlier battle-cruisers of the *Indomitable* class, mounting the 12-inch gun. She has cut her personnel from 450,000 to 100,000 men, which is less than the total in our own navy. And this, mark you, our allies have done on their own initiative, without waiting for us to put our own name to the treaty of which we are the foster parent.

And what has been the response of the United States? What have we done in the matter of the treaty and disarmament? As regards the treaty, after months of embittered and rancorous debate, during which our European allies have looked on in dumbfounded amazement, this child of ours has been officially crucified by the representatives of the great people who gave it birth. And it affords us poor consolation to know (since Europe does not know it) that the Senate, in all its history was never so unrepresentative of the will of the American people as when it did this totally unexpected and most outrageous thing.

As for what we are doing as our share in a disarmament of our own proposing, we cannot do better than quote from the recent report of the Secretary of the Navy: "With battleships in service equal to or superior to any now in commission and six huge battle-cruisers and twelve battleships under construction, a number of them larger than any now in commission, the navy is pressing forward to greater things."

So while our allies are putting through in good faith a drastic reduction of their naval forces, our naval secretary, the great protagonist of disarmament, boasts that we are not only building eighteen battleships and battle-cruisers, but that the navy is "pressing forward to even greater things."

As to the abandonment of the second three-year program, it was common gossip in the lobbies of Congress that the ships were never intended to be built. It was a paper fleet; and to call its abandonment, disarmament, is merely to juggle with words.

Many of these eighteen capital ships to which the secretary refers are, or course, so far advanced that, as in the case of the British *Hood*, it would be economy to push them through to completion. Thus, the six battleships of the *Tennessee* type should be finished. The plans of the six 35-knot battle-cruisers are being redrawn. A comparatively slight increase in their size and a reduction in their speed to 32 knots, would enable their armor plan to be made equal to that of the *Hood*. If heavier armor were used and worked into the decks rather than on the sides, we should have a better design than the *Hood*. We need these fast ships to round out our navy; but as to the six 42,000-ton battleships upon which little or nothing has been done, it would be a gross waste of public moneys to commence their construction at the present time. If Great Britain should scrap her 12-inch-gun dreadnoughts, as seems likely, we shall be stronger in capital ships than she; and she has stated semi-officially that she will build no capital ships for five years to come.

To embark on the unnecessary construction of six huge ships, costing by the time they are completed a quarter of a billion dollars, will serve merely to arouse suspicion, accentuate the tragic collapse of international confidence due to our repudiation of the treaty, and impose further burdens of taxation upon an already overburdened people.—*Scientific American*, Dec. 20, 1919.

## MATÉRIEL

LAUNCH OF U. S. HOSPITAL SHIP "RELIEF."—The U. S. hospital ship *Relief* was launched at the navy yard, Philadelphia, Pa., Dec. 23, 1919. The vessel is splendidly equipped and carries 500 beds, with complete operating rooms and field hospital equipment. She is divided into wards, where various diseases can be segregated. She is of 10,000 tons displacement and is 483 feet long, and has a speed of 16 knots. Congress appropriated $3,250,000 for the ship.—*Army and Navy Journal,* Dec. 20, 1919.

LAUNCH OF U. S. SUBMARINE "S-16."—The U. S. submarine *S-16* was launched at Bridgeport, Conn., Dec. 23, 1919, by the Lake Torpedoboat Co. The *S-16,* which is the thirtieth submarine to be constructed by the Lake Company, is 231 feet in length and of 1500 tons displacement submerged. She embodies the latest plans in submersibles, and has a cruising radius of 5000 miles. The *S-16* has "wet guns" on her deck, which means that they need not be lowered through the hatch when the vessel submerges, but are ready for instant use when the vessel comes to the surface.—*Army and Navy Journal,* Dec. 20, 1919.

NAVY URGES IMPROVEMENT ON WEST COAST.—Urging that steps be taken immediately to secure from Congress authorization and an appropriation for improvement of the entrance to San Francisco harbor, Secretary Daniels on Dec. 13 sent a letter to the Secretary of War, in which was enclosed a letter from Admiral Hugh Rodman, commanding the Pacific fleet. The latter recommends a channel 40 feet wide, and preferably a 45 foot channel based on estimates of Col. F. V. Abbott, acting Chief of Engineers, U. S. A. The Secretary's letter states: "The largest navy vessels have a mean draft of 33 feet and may at times draw more than that. The entrance to San Francisco harbor for vessels of that draft is very unsatisfactory. Bonita channel contains dangerous rocks, the channel across the bar is not of sufficient depth, and the south channel is not of sufficient depth and is tortuous. The department considers it a matter of grave importance that steps be taken immediately to provide an entrance to San Francisco Bay that will give a channel across the bar of at least 42 feet in depth and 1500 feet in width. San Francisco Bay is the navy's most important base on the Pacific coast and there is only one other base at the present time to be utilized, namely, Puget Sound. It is requested that steps be taken to secure Congressional authority and appropriation for providing this channel during the present session."—*Army and Navy Journal,* Dec. 20, 1919.

TORPEDO STATION.—A naval torpedo station has just been completed at Alexandria, Va., 7 miles south of Washington, on the Potomac River. The plant cost $1,500,000 and will employ 1500 people. When in full operation it will be able to turn out eight torpedoes a day. The torpedoes are 21 inches in diameter, 22 feet in length, and are made up of over 3000 parts. It requires mechanics of great skill to fit the intricate parts together as some parts are as small as those used in making watches. The torpedoes will be built and assembled at this station and the explosives will be placed in them after they have been inspected.—*The Log,* Dec. 12, 1919.

## PERSONNEL

AVIATOR'S UNIFORM.—It has been practically decided to amend the naval uniform regulations so as to abolish the uniform worn by aviators, which is distinct from the regular officer's uniform. The present uniform resembles the army uniform, being of olive green cloth, with leggins, but having the navy cap and marks of rank. Officers detailed from the line will not be required to buy new outfits when transferred from one branch to the other.—*The Log,* Dec. 12, 1919.

A PLAN TO TRAIN AMERICAN SAILORS.—A plan to train American sailors in the U. S. Navy and then permit them to go to the Shipping Board or Army Transport Service if they desired was brought out during one of the recent hearings before the House Committee on Naval Affairs when Rear Admiral Thomas Washington, U. S. N., chief of the Bureau of Navigation, was telling the members of the committee of the difficulties the navy had in keeping enlisted men in the service as against the superior attractions in the way of pay of the Shipping Board vessels and the Army Transport Service. Mr. Hicks presented a series of suggestions made by Mr. I. N. Hibbard, of the Shipping Board, which read:

"Arrange with the necessary authorities to provide for a preliminary enlistment in the navy of one year, at the end of which the boys would have the option of enlisting in the navy for two years, joining the merchant marine or recruiting to life on shore. The apprentices taken in for training by the Shipping Board are not legally bound, while under this plan they would be, and as the navy has all the equipment necessary which is not now being used, a great saving could be made by giving up all the training activities of the Shipping Board and at the same time increase the number of American seamen who would be much better trained and disciplined who would be available to man army and navy transports if they were ever needed, and the basis for a very satisfactory naval reserve would easily be selected from the best material in the country. All the staff the Shipping Board would need is a small bureau to keep track of the names and location of the men whose enlistments were about to expire and see that the boys were informed as to what opportunities the merchant marine had to offer and that positions were found for those who desired to join mechant ships."—*Army and Navy Journal,* Jan. 3, 19120.

ORGANIZING THE U. S. NAVAL RESERVE FORCE.—The U. S. Naval Reserve Force is being organized into units and divisions to provide a means for giving enrolled members an opportunity to perform drills and cruises necessary to gain confirmation for those who are not yet confirmed and to maintain the efficiency of those already confirmed. It is expected at the Navy Department that vessels will shortly be assigned to all naval districts and that certain shore armories will be maintained to provide places where the enlisted men of the Reserve Force can obtain information, confirmation, instruction, recreation, and a place to swing a hammock when they desire. At these places it is intended to have officers who are desirous of helping a man to obtain everything he is entitled to under the Naval Reserve law. In this connection it is learned that there are approximately 250,000 enlisted men in the Reserve Force on inactive duty, 72,675 alone in the towns within the confines of the 9th, 10th and 11th Districts. Chicago leads all cities with 11,682. The commissioned personnel of the Reserve Force at Boston had arranged a get-together conference for January 9, at which Captain H. P. Ziegemeier, chief of the Naval Reserve Force Division of the Bureau of Navigation, will make an address.—*Army and Navy Journal,* Dec. 20, 1919.

UNIVERSAL TRAINING.—The result of a questionnaire on the subject of universal military training submitted to 2000 temporary officers upon discharge from the U. S. Army has been made public by the Morale Branch, War Plans Division, General Staff. The replies showed that 1868 officers were in favor of universal military training and 132 were opposed to it. Further classification showed that 59 per cent favor training without qualifications, 35 per cent indicated qualifications or offered suggestions, 3 per cent were unfavorable without qualifications and 3 per cent with qualifications.—*Army and Navy Journal,* Dec. 20, 1919.

NAVY MORALE DIVISION.—The 6th Division (Morale) of the Bureau of Navigation, Navy Department, is not only making marked progress in its

work, but it has been assigned office space of its own in the seventh wing of the navy building at Washington. Under the direction of Commander Claude B. Mayo, U. S. N., and without expense to the department, this portion of the wing was reconstructed so as to provide a large central room in which to display the "instruments" of the division, handsomely framed photographs showing the complete industry included in the navy's technical instruction of young men, paintings of war incidents, trophies, etc., and the equipment necessary to test the moving picture films which are now distributed to all ships and shore stations. In the short time this division has been operating it has become thoroughly imbued with the enthusiasm of Commander Mayo, so that its activities, from religion to "general information," require a pamphlet of instructions of 106 pages and 468 paragraphs. At a meeting of officers for morale at the department on December 16 it was decided to take over the buildings, equipment and workers of the welfare organizations now installed at naval stations on January 1. The Committee of Eleven, representing the welfare organizations, will also turn over to the navy a substantial fund to carry on the work to the end of the fiscal year, July 1, 1920. The work of these organizations will contiue exactly as before, except that the workers will be paid by the navy. In the event that the work is cut down the civilians who are to be discharged will receive 90 days' notice. The same uniform will be worn, but without insignia, until such time as a new uniform is adopted for these welfare specialists. The buildings will be known as clubs, and the designation "hut," which is not American, will be abolished. Each station will select an appropriate name for its club from a list of navy heroes, such as Paul Jones, Farragut, Dewey, etc. The Marine Corps clubs will follow the same method. In connection with the rapidly expanding motion picture portion of the 6th Division's work, the rifle and pistol range at the New York Navy Yard has been turned over to the division and is being converted into a motion picture repair, inspection and storage plant, where large quantities of film purchased for use of the ships and stations will be inspected and shipped. The division has also perfected arrangements for the first use of colored lantern slides made on film to illustrate its lectures on ports of the world now supplied to each ship when ordered on a cruise.—*Army and Navy Journal*, Dec. 20, 1919.

## MERCHANT MARINE

AMERICAN OFFICERS FOR THE AMERICAN MERCHANT MARINE.—In its determination to Americanize the merchant marine, the United States Shipping Board has announced that posts on vessels of 4000 deadweight tons and larger will be given only to officers of United States citizenship. On the smaller vessels, which include the lakes type of steel cargo carriers and the ships of wooden construction the communication, which was issued several weeks ago, provides that officers of foreign citizenship may be employed if there are no American officers available.

During the war, when the United States issued thousands of "red ink" licenses to foreigners, there were a great number of these officers on the Shipping Board vessels. While no exact figures are available as to the number of British, Norwegian, French and Italian citizens who qualified for service on board American ships, it is estimated that there were easily 2000 permits of this type issued. They were to be good only until the proclamation of peace, however, and recently there has been quite a bit of agitation to have the life of the "red ink" licenses extended.

The text of the most pertinent paragraphs of the order follows:

"1. On vessels of 4000 deadweight tons or larger only American citizens shall be employed.

"2. On vessels of less than 4000 deadweight tons officers of foreign citizenship holding United States provisional licenses may be employed but duly qualified American citizens shall be given first preference when avail-

able. No officer holding a United States provisional license shall be employed as master or chief engineer, if there is a duly qualified American citizen available."

In section three, the Shipping Board announces that no foreign officer is to be discharged from his position, provided he has given satisfaction. This would prevent the United States from seeming to be ungrateful for the services that the "red ink" officers rendered during the war when there was an insufficient supply of qualified American officers to maintain the bridge of ships which spanned the Atlantic.

At the New York offices of the Shipping Board's Sea Service Bureau it was announced that little trouble had been experienced in obtaining sufficiently large crews to man the better steel ships, but it was learned that the sailors and firemen are somewhat skittish about shipping on the wooden vessels and the smaller steel ships.

During the past few weeks the offices have been flooded by applications from foreign officers who are deserting ships operating under the British and Norwegian flag to gain posts on American vessels. It is pointed out that the higher wages and better quarters aboard ship are attracting some of the best officers in the merchant marines of other nations.

Anent this matter, the British are somewhat concerned. The following article recently appeared in the Liverpool *Journal of Commerce:*

"During the past few weeks a number of experienced captains and officers have left these shores to try their luck in the United States as regards employment, and although this is greatly regretted, the loss of experienced seamen to the country, they are wished all possible success in their new departure.

"Only the difficulty which is experienced in getting passages prevents a still larger number of officers taking the same step. While certain difficulties exist as regards the lack of discipline and the experience in many cases of the officers and seamen who man these American ships, it must be admitted, on the other hand, that the pay and other conditions are most decidedly attractive.

"Many of these men have been forced into taking this course by the dismal outlook which exists in regard to the matter of employment in the British merchant service, and the fact that the sale of new ships to foreign buyers still continues as a source of extreme exasperation to these men who have served the country so well during the war. The Imperial Merchant Service Guild has repeatedly protested in the strongest possible manner against the sale of these ships when so much unemployment exists, but it would appear from replies that have been received from the minister of shipping that the British Government having contracted certain liabilities during the war in this respect are in honor bound to carry them out."—*Shipping*, Dec. 17, 1919.

WATERTIGHT DOORS VERSUS SOLID BULKHEADS.—The great destruction of merchant ships during the war has led to the revival of the question whether it might not be practicable to largely reduce the number of watertight doors in modern vessels. That these constitute a danger in the event of a collision has been abundantly proven. When an unexpected disaster at sea has occurred, the watertight doors have been usually open and the crew cannot be relied upon to close them in a sudden emergency. Should two compartments through any unforeseen contingency be opened to the inrush of the sea and the watertight doors to the next compartment be left open, the vessels will in time lose its stability and capsize. The suggestion has therefore been made that when dangerous conditions arise, all watertight doors and port holes below the top of watertight bulkheads should be closed and not reopened until the period of peril was passed.

While the war was still on, one of the committee of the Institution of Naval Architects recommended that all watertight doors, especially if they were low down in main bulkheads, should be secured so that they could

not be opened. It urged further that, whenever installed, the doors should be fitted high up in the bulkhead. This was considered by the committee to be particularly important when bunker coal is carried forward of the boiler-room bulkhead, as a watertight door through which coal is being trimmed cannot be relied upon. Ordinarily this would mean lifting the coal in the reserve bunker over the top of the boiler-room bulkheads, or through the watertight door openings cut high up in the bulkhead, thus necessitating extra work for and the employment of a larger engine-room force. On account of the expense involved, shipowners have not regarded this suggestion with favor.

As the convenience of working a ship has outweighed all other considerations, watertight doors are still being fitted. Doors giving access to various compartments are useful at all times, while only once in a decade may a ship be placed in jeopardy through their presence. There must be a means of access to coal bunkers and some method by which members of the crew can pass from the boiler to the engine rooms and vice-versa. Of course if watertight doors were to be omitted from the machinery spaces, access might be had to the various watertight compartments from the top deck. But this would mean more engineer officers and a larger crew and add greatly to the difficulties of operating ships, especially in the case of passenger craft.

From the standpoint of safety, watertight doors are objectionable in that they are usually left open and are extremely hard to shut. This difficulty can be overcome, however, by installing doors which are controlled from the bridge and can be closed by power pressure. As compared with a system of solid bulkheads, a series of centrally controlled power-operated watertight doors offer overwhelming advantages. It is safe to assume that all the great passenger liners of the future will have their bulkheads pierced for watertight doors, whose movements will be directed by the officers in command on the bridge.—*The Nautical Gazette*, Dec. 6, 1919.

NON-ROLLING PASSENGER LINERS.—The announcement that the Shipping Board intends to equip all of the seven former German liners assigned to its new South American service with gyrostabilizers lends added interest to Mr. Elmer A. Sperry's recent very instructive address before the Society of Naval Architects and Marine Engineers on non-rolling passenger liners. In the extracts from his lecture Mr. Sperry gives an outline of the various devices which have been tried out at one time or another during the last 35 years in the hope of keeping ships on an even keel. These have been successively anti-rolling tanks, Sir John Thornycroft's pendulum stabilizer, Herr Frahm's horseshoe tanks and Dr. Schlick's gyrostat: All these appliances are subject to the common objection that they only come into play whenever a heavy swell prevails and are quite inefficacious in the event of the sea being only moderately agitated. The damping or anti-rolling tanks possess the drawback of occupying so much space as to be undesirable from a commercial standpoint. Furthermore, unless the movement of their contents synchronizes properly with the oscillations of the ship, they tend to increase instead of diminishing the roll of a vessel. Because of its weighing five per cent of a vessel's displacement, the Thornycroft stabilizer is impracticable as well as inadequate.

Unlike the devices just named, the gyroscope acts at all times, whether a ship is laboring heavily in a gale or undergoing a barely perceptible roll. When used as a stabilizer on board of a ship, heavy gyros have to be employed, fitted with automatically governed precession engines. These last move the gyros in whatever direction is called for in order to check the movement of a vessel before it has gathered speed or force. The effectiveness of a gyroscope is determined by multiplying its actual weight by the velocity with which it rotates, which in some instances has reached 1150 revolutions per second. Consequently, when made to revolve at a high rate of speed, the mass of the gyroscope only needs to be one per cent

of a ship's displacement in order to neutralize or offset the motion imparted to a vessel by the restless sea. A craft equipped with a small stabilizing apparatus is subject to far less strain than an ordinary ship and need not be equipped with bilge keels, which so appreciably retard the speed of modern liners.

Another advantage claimed for the gyroscope is that it enables steamers to run on schedule time, even under stormy conditions. No necessity exists for slowing down in rough weather or when heavy seas prevail. As a stabilized ship rides the waves in a vertical position without being pounded by the ocean's waters and without shipping seas, her decks remain almost dry. Thus the day would seem to be not far distant when a comparatively smooth voyage across the Atlantic can be guaranteed at all seasons of the year, no matter what the state of the weather or the size of the waves may be. On the stabilized liners of the future, the present discomforts of ocean travel will be largely minimized and seasickness to a large extent banished. With the perfection of the gyroscope, a new era in the world's passenger carrying trade would seem to be close at hand.—*The Nautical Gazette*, Dec. 27, 1919.

FLOATING MINE PERILS.—Navigation in the North and Baltic seas continues to be rendered unsafe by the presence of many floating mines, and there seems to be little likelihood of these waters being freed from this peril for some years to come. Dutch papers have recently complained that the minesweepers, otherwise known as the "suicide fleet," sent out by the United States to remove the American mine barrier across the North Sea, have not performed their task properly. After every severe storm unswept American anchored mines break loose, necessitating the taking of the greatest precautions when navigating near the Dutch coast. Even more menacing are conditions in the neighborhood of the German mine fields, which, beginning at a spot to the north of Terschelling and Ameland, stretched for a distance of 180 miles as far as the bight of Heligoland. This great mine area has never been swept adequately, and within or close to it the American steamers *West Arvada*, *Council Bluffs Kerwood*, and *Liberty Glo* have all been sent to the bottom recently through coming in contact with floating mines.

In a lately delivered lecture, the Prince of Monaco stated that the mines laid by the various belligerents between 1914-1918 would find their way all over the globe and would constitute a danger to passing vessels for a long period hereafter. Corroborative of this assertion is the admission on the part of the International Mine-Destroying Committee that at the best the different systems of sweeping employed by the British and American navies succeeded in only gathering up about one-half of all the mines originally planted. Of the remainder, one-fifth become in time harmless, while the remaining 30 per cent drift with the ocean currents and remain a constant menace to shipping until cast ashore on some distant coast. Thus one of the unforeseen consequences of the long era of hostilities has been to add the mine-hazard to the list of the perils of the deep.—*The Nautical Gazette*, Dec. 27, 1919.

AN AGGRESSIVE FOREIGN TRADE POLICY.—An aggressive foreign trade policy will be followed by the government through the Department of Commerce to aid American business interests in obtaining footholds in foreign markets.

Yet this aggressiveness must be held within reasonable bounds in order that unfair advantage might not be taken of this country's foreign trade competitors until their reconstruction problems have been solved.

Despite this qualification, it is the desire of the department to extend every possible aid to American exporters and business interests generally for the sale of greater amounts of American products and manufactures in foreign markets than have marked the foreign trade operations of the United States in the past.

It is firmly opposed to the further extension of government credits to the European governments for the purchase of necessities and reconstruction materials. The task of financing American sales abroad is one that should be shouldered by private commercial interests and not continued as one of the government's burdens for an indefinite period of time within the future. Only after every other means of financing foreign purchases in the United States has been exhausted should the method of direct government loans be considered. The Edge bill, when it comes into operation, should be adequate to solve the credit problem.—*Shipping*, Dec. 31, 1919.

NATIONAL MARINE WEEK.—To arouse the people of the entire country to take a voting and investing interest in the American merchant marine and thus establish the maritime independence of the United States, a series of demonstrations, nationwide in scope but centering in New York, will be held next April 12-17 under the designation of National Marine Week, it has been announced by the National Marine League under whose auspices the program has been arranged. Parades, dinners, exhibits and an exposition of the largest collection of ship models ever gathered in America will be features of the week's ceremonies which will be opened by Secretary of Commerce Joshua W. Alexander, Chairman John Barton Payne of the U. S. Shipping Board; Senator Wesley L. Jones, Chairman of the Senate Commerce Committee; Hon. William S. Greene, Chairman of the House Merchant Marine Committee and others prominent in national maritime affairs. The co-operation of all who have the interest of the American Merchant Marine at heart is asked for by the league.

"The time has come," says a statement issued by the league, "for the nation to realize the pressing economic importance of national maritime independence. American cargoes, mails and passengers must be carried largely in ships built, owned, operated and manned by Americans—in ships equipped and repaired by American industry and classified and insured by American companies. It is a matter of the greatest importance to the inland as well as to the seaboard states that our mechant marine be put upon a permanent basis of healthy development.

"National Marine Week is planned to create that popular interest in the merchant marine which Mr. Hurley, Mr. Schwab and Judge Payne have continually called for. It is the inevitable conclusion of the men who have studied the task that the people themselves must be awakened to our maritime possibilities. Americans must become interested in maritime legislation. They must invest money in shipping enterprises as the people of all other maritime powers have done. The American boy must come down to the sea. The country itself must be brought 'to think in terms of ships.' Until these things come to pass it cannot be said truly that we have a healthy merchant marine."

## ENGINEERING

THE TREND AND DEVELOPMENT OF THE SEMI-DIESEL.—To say that the oil engine has stood still during the past few years would be to give an entirely wrong impression of what has actually been happening. Taking the so-called semi-Diesel as a sample case in point, it has stood still in so much that it has held all the ground that it has previously made, and it has become partly standardized. So far, then, the above statement is true, but no further. It, on the other hand, while holding all the ground won so hardly against the prejudice of users of other types of prime movers, has made a triumphant progress, and is now in a fair way to occupy a place second to none in the markets of the world.

The reasons that bring this about are not very far to seek; and it may be of interest to briefly enumerate them here. The ordinary type of semi-Diesel, with which we are all familiar, is of course the two-stroke hot-bulb

engine, and the first reason for its success is its very simplicity. There is little or nothing to go wrong where reasonable care is exercised in installation and in looking after the engine while running, and now that the details of proportion on working parts have become more or less standardized through long experience there are no special troubles to be guarded against in the case of the hot-bulb engine which does not with equal force apply to the steam driven plant. On fuel costs the present day hot-bulb engine is becoming a by no means to be despised rival of the Diesel proper, and where the power per cylinder required is not too great, the hot-bulb type or some of its modifications has many advantages.

To-day we see the semi-Diesel going ahead as it has never gone before, both in popularity and in development along progressive lines. At one time, and this is not so very long ago, makers were satisfied to turn out engines that would run reliably, and they showed very little inclination to trouble themselves about anything else, the heavy duty oil engine was then more or less of a novelty, in this country at any rate, and steam users took a great deal of convincing that an oil engine could ever be anything other than an experiment of doubtful reliability. Under these circumstances it was perhaps not surprising that makers should have devoted most of their energies to convincing the public that their particular product could be relied on to give reliable service, and that it would not break down when most needed. Since then times have changed, and the public have altered the point of view from which they regarded the oil engine and everything connected with it. Now we find that there are quite a considerable number of engines on the market of different makes, each one with a proved reliability under varying conditions sufficient to satisfy the most timid user; this entirely alters the position of the manufacturer as he cannot sell his engine on reliability alone and must perforce go into the question of what is specially required to meet the needs of the largest number of users.

How has this affected developement? If we consider the oil engine for marine propulsion we can perhaps answer this most readily, as it is on the marine side that the development has been, and is the most noticeable at the present time. The early reliable engines were open to certain objections for marine work, specially under certain circumstances, and it is these objections which are being rapidly removed from day to day. Engines, in all but the smallest sizes, had to use fresh water injection to the combustion space except when on the very lightest of loads, and though this often was of no moment in installations on shore, and frequently did not matter much when installed in vessels trading coastwise and never far from a port where the fresh water tanks could be replenished, when installed in deep water ships making voyages of a length of several weeks away from port at one time, this question of fresh water injection became a very serious problem to be faced. The trend of modern progress is to do away with fresh water injection where its use is undesirable, and this is achieved in various ways by different makers, prominent among the methods adopted being to modify the bulb in such a way that external cooling of the head becomes practicable; in fact, in some cases the modification is carried to such a point that the hot-bulb as such is done away with altogether and a hot plate is substituted. Another way is to supply high pressure air blast directly to the hottest part of the combustion space, thereby bringing about cooling and also assisting scavenging. It used to be difficult to run a hot-bulb for extended periods on light load or on no load at all without the bulb cooling off, and the application of external heat becoming necessary. This difficulty has been in some cases largely reduced, and in others entirely got over by a variety of methods, including regulating the admission of the incoming air in proportion to the work being done by the engine, also by providing for a small pre-injection of fuel, thus aiding combustion and maintaining the required temperature; and by other methods too numerous to go into in detail

here. In respect to the purely marine engine, the problem of reversing the direction of rotation of the propeller used to be dealt with, and in fact still is brought about, in various ways. Among these we have the reversing by means of a sun-and-planet or other similar mechanical gear, in which case the engine retains one direction of rotation throughout, or in small vessels by means of a propeller with reversing blades to which the same remarks apply. Other makers reverse the engine itself by means of a correctly-timed pre-injection of fuel of considerable volume used in connection with a suitable friction clutch which enables the propeller to be disconnected from the engine until such time as the reversal has actually taken place. This method of reversal is quite satisfactory when handled by a man of average intelligence, but is open to the objection that it is not absolutely instantaneous as when running at full speed in one direction, it takes a few seconds for the engine to slow sufficiently for the reversal to take place.

In four cylinder engines and upwards compressed air reversing is gaining ground, either with or without a clutch and this is brought about by the fuel being cut off and high-pressure air being admitted through suitably-arranged mechanically-operated valves. This method is the most rapid, and also perhaps the most certain.

With large hot-bulb engines it used to be customary to allow from 20 minutes to half an hour for the purpose of warming up preparatory to a start being made, and as to approach more nearly to the ideal attained by the Diesel proper of starting at any time from cold by the use of compressed air only.

Though to be able to start from cold is no doubt of the greatest advantage, it must not be forgotten that even the introduction of a multiple stage air compressor means added complication, as also does the use of electrically heated plugs. From this it will be appreciated that though many of the present day improvements make all the difference to the capabilities of the engine, it must be borne in mind by designers that having regard to the type of man who is usually to be found in charge of semi-Diesels, any complication is a thing to be avoided if possible.

There is one point which occurs to the writer which, though perhaps outside the true scope of this article, nevertheless is of the greatest importance to the makers of semi-Diesels for marine work, did they only realize it and that is that a suitable method has still to be found of driving auxiliary machinery in small vessels such as winches, windlasses, and steering gears.

In larger vessels where an electrician is carried, the matter is simple, or where a man accustomed to steam can also be found willing to handle the oil engine, the difficulty can be got over by compromise. In the case of the small vessel when a suitable simple means is arrived at and has proved itself reliable in use, the market for semi-Diesels will extend with marvellous rapidity.

The power plant for running the auxiliaries should be situated in the main engine room, and there must be elasticity between the prime mover and the auxiliary.—*Shipping*, Dec. 24, 1919.

DETECTION OF OIL SOURCES CLAIMED BY ELECTRICAL MEANS.—Locating crude petroleum by means of an electrical device, no matter how far beneath the earth's surface the product may be, has been successfully done in the shallow field near Corsicana, Texas, during the last few weeks, according to reports given for what they may be worth by the *Electrical Review;* and Eugene Elkins, the inventor of the instrument, has gone to the outlying district around Burkburnett to make further practical tests of what is claimed to be a very remarkable invention. The oil industry may be revolutionized if oil pools can be located by means of so simple an instrument. The principle upon which it works is described by Mr. Elkins as follows:

"The system consists in forming an electrical circuit through the earth by dropping an insulated wire to the bottom of a dry water hole, valley or indentation and placing a series of batteries on top of the earth, to the positive pole of which is attached a land wire. This land wire is then taken out over the field in any direction and for any distance and all of the intermediate territory is combed thoroughly with electric currents flowing from the anode or positive pole to the cathode or negative pole. The earth being simply a huge inverted magnet, the electric currents travel from one to the other of the charged poles by the path of least resistance, much as does the return current of the telegraph system through its ground wires to the point of origin.

"Oil and its constituent components being the only minerals in the earth through which electricity cannot pass, it therefore follows that an oil pool in the path of the electric currents mentioned will offer a great resistance to the said currents; and we register these resistances on an extremely delicate meter in the hands of the operator on the surface of the earth."—*Scientific American,* Dec. 6, 1919.

PERSONALITY.—It was character that made the great engineers of the past, and if individual engineers of to-day seem to stand out with less clearness than those of, let us say, not more than 40 or 50 years ago, it is, we think, because, despite their greater knowledge and their greater opportunities, they are lacking in those strong personal characteristics which marked their predecessors. Perchance this is another case where standardization is having those baleful effects which we so much dread. All engineers nowadays receive much the same training; they go through the shops under very favorable conditions, and they pass on to colleges and universities, where they receive a scheduled education and pass examinations which are common to thousands. In all this there is very little opportunity for diversity. No one man stands out above his fellows because he has had to overcome difficulties by exceptional personal endeavor. There is very little character-building quality in our educational systems. Their object, from the lowest to the highest grade, is to turn out a standardized product—indeed, the word standard is frequently used in educational circles to indicate proficiency. Now, as there can be no differences in products which attain to certain standards, it is obvious that the effect is to turn out a lot of engineers who are all just alike. It is no doubt hoped, and believed, that the natural personal characteristics of the individuals will make differences. So they do; but our impression, shared by many people, is that the effect is far less pronounced than could be desired, and that the broad effect of standardizing education and training is also to standardize character. The level of character is, possibly, high, but we miss those brilliant departures from the level, caused by inequalities of opportunity, which provided us with our famous engineers. It may be, we greatly fear that it is, the fact that the humdrum, manufacturing, making-by-the-league-and-cutting-off-by-the-ell, moving-platformed, routed, rig-and-jigged engineering of to-day is better served by a high-level mediocrity than by a general inferiority punctuated by transcendent exceptions, but we are, nevertheless, firmly convinced that the greatest events in engineering spring directly from the personality of individuals, and that, though mass knowledge may be best for mass production, we shall look to it in vain for achievements equal to those attained by the great characters which trod our stage in days gone by. "O Roma Dea," said Maximus, "It is always one man's work, always and everywhere."—*The Engineer,* Dec. 5, 1919.

WHY BOILERS EXPLODE.—In a recent issue of *Power* C. E. Stromeyer, chief engineer of the Manchester, England, Steam Users' Association, commented upon the large number of boiler explosions in the United States as compared with those in other countries. The reason has long

been known. Other countries exercise intelligent supervision over the design, construction and operation of boilers, and when one explodes a real investigation is made of the condition, and the responsibility fixed. In the majority of our states one may build a boiler any old way that he pleases, out of any kind of stock he can get, carry any pressure upon it that he has a mind to, and hire anyone who comes along to run it.

To those who are accustomed to expert supervision, and acquainted with its effect, this state of affairs is unbelievable. The inhumanity and economic ruthlessness of permitting a hundred or two of preventable boiler explosions a year, rather than to tolerate "Governmental interference with private property," and to maintain the "let us alone" attitude of "we will do as we please with what is our own. The risk is ours—we will pay the damage if there is any," is appalling. There is a gradual weakening in progress, and now 15 out of our 48 states have provided more or less thorough means for the inspection and control of boilers, and four states and 29 cities have laws providing for the certification of the men into whose charge they are given.

A pertinent example of the result of unsupervised operation is given in this issue. The boiler, the explosion of which is there described, was second-hand, a dozen years old, and had never been inspected, except at the time of its purchase a year ago. After the explosion the stem of the safety valve was found so crooked that it took a blow from a small sledge to move it through the cap in either direction. One would suppose that the men in charge of a boiler, whose lives are menaced by any risk incurred in its operation, would be on their guard against such a condition. But they do not know, and innumerable instances of this kind have no weight with the average legislator against the manufacturing constituent who wants to be let alone, or the lobbying dealer.—*Power*, Jan. 6, 1920.

RECENT IMPROVEMENTS IN TURBINES.—As pointed out by Sir Charles Parsons, President of the British Association for the Advancement of Science, the turbine of to-day carries the expansion of steam much further than has been found possible in any reciprocating engine, and owing to this property it has surpassed it in the economy of coal.

Among the minor improvements which in recent years have conduced to a higher efficiency in turbines are the more accurate curvature of the blades to avoid eddy losses in the steam, the raising of the peripheral velocities of the blades to nearly the velocity of the steam impinging upon them, and details of construction to reduce leakages to a minimum. In turbines of 20,000 h. p. to 30,000 h. p. 81 per cent of the available energy in the steam is now obtainable as brake horsepower; and with a boiler efficiency of 85 per cent the thermodynamic efficiency from the fuel to the electrical output of the alternator has reached 23 per cent, and shortly may reach 28 per cent, a result rivaling the efficiency of internal-combustion engines worked by producer gas.

During the 20 years immediately preceding the war turbo-generators had increased in size from 500 kw. to 25,000 kw., and the consumption of steam had fallen from 17 lb. per kilowatt-hour to 10.3 lb per kilowatt-hour. Turbines have become the recognized means of generating electricity from steam on a large scale. The aggregate horsepower of war and mercantile turbined vessels throughout the world is now about 35,000,000.

These advances in power and speed have been made possible mainly by the successive increase in economy and diminution of weight derived from the replacement of reciprocating engines by turbines direct-coupled to the propellers and, later, by the introduction of reduction gearing between the turbines and the propellers; also by the adoption of water-tube boilers and of oil fuel.—*The Nautical Gazette*, Nov. 22, 1919.

DEVELOPMENT OF GEARED TURBINES FOR THE PROPULSION OF SHIPS.—It was not until the success of the marine steam turbine had been assured

by its rapid adoption in vessels of moderate and high speed, and more time was available, that attention was directed to the application of the turbine to slow speed vessels by the introduction of gearing between the turbine and propeller. Several forms of gearing have been proposed, such as electrical, hydraulic and mechanical. Electrical and hydraulic transmission gears have been fitted in a few ships, but the greater majority of vessels have been fitted with mechanical gearing.

Within the last three or four years a further development has taken place in the case of mercantile vessels by the adoption of double reduction gearing instead of single reduction gearing, which had previously been the practice.

Double reduction gearing permits of larger ratios between the revolutions of turbine and propellers being obtained without excessive size of gear wheel, so that even in very slow speed vessels the turbines may be designed to run at the speed for maximum economy. The increased efficiency obtainable with a double reduction scheme and higher speed turbines as compared with turbines and single reduction gears is in some cases as much as 7 per cent.

As regards the life of gearing, there appears as the result of experience to be no reason why it should not have a very long life, provided, of course, that ordinary precautions are taken in the manufacture and cutting of the gears, and that efficient lubrication is provided. In this connection it may be mentioned that the gearing of the *Vespasian* shows practically no signs of wear. The *Cairnross,* which was the next vessel to the *Vespasian* to be fitted with geared turbines, has unfortunately been sunk by enemy action. The *Mahanada* has now been 4¾ years on continual service, and from a report made quite recently the gearing is "in as good a condition as when it first left the builders' works"; from inquiries made from the owners of this vessel, the turbines and gearing during this period have not cost anything for upkeep.—*The Nautical Gazette,* Nov., 22, 1919.

U. S. SHIPPING BOARD'S FUEL STATIONS.—American steamships can soon make a circuit of the world without the need of taking fuel at other than American owned fuel stations. This applies to vessels steaming east from the Atlantic coast or west from the Pacific seaboard.

The as yet unwritten history of this accomplishment dates from the time when war conditions developed an acute situation in the world's coal supply. During the early stages of the war, Great Britain put into effect a system of bunker license as a necessary military measure. The United States Shipping Board realized that after-war conditions might develop a situation with respect to coal supplies that would dictate the necessity of a modified application of bunker license at British stations. In that event we would have been at a serious disadvantage unless immediate steps were taken to assure unrestricted operation of our ships in the world's trade. To accomplish this it was necessary to have oil burning steamships, instead of coal burners, with a large steaming radius, and so far as practicable this to be fixed at a minimum of 10,000 miles. The British order of September 29, 1919, justified these apprehensions. But at that time we were ready.

*Establishing Oil Stations.*—The next task was to find suitable places for the establishment of fuel stations along the trade lanes or adjacent to them. At the Panama Canal, the turn at the world's cross-road, facilities already existed and only required to be amplified. To take care of the east coast trade of South Africa, a station was erected at St. Thomas. This station, which had an initial capacity of 15,000 tons of storage, was opened on October 2.

Arrangements have been made for establishing a station at the Azores and another at Bizerta, a small French island off Tunis and located on

the ocean highway to the Indies. Material has been assembled at Manila, where another large storage tank is to be located.

*Looking to the Future.*—"Despite what has been done," said J. H. Rosseter, Director of the Shipping Board's Division of Operations, "we feel we are still at the threshold of the major part of the question, this involving an increase in storage capacity of fuel stations and additional tank steamships for transporting oil to them. We must also take into account the fact that we must now carry oil to our Atlantic seaports, not only from Mexico, but from Texas and the Louisiana fields as well.

"Finally we must awake to the importance of encouraging the establishment of national interest in other known and probable oil regions of the world. For two years our British friends have been admirably directing their attention to new oil regions, notably those of Colombia, Venezuela and Ecuador, and also to the fields of the Levant in which it is surmised that the fields of Turkey promise results exceeding the output of the great fields of California, which the Turkish fields are said to resemble. It has become necessary for us to look far afield, to safeguard the future. The value of this great mineral wealth can fairly be stated as three to one for sea use as compared with use on land."

*Oil Burning Ships.*—The picture of what America accomplished during the war became familiar to all. But what America has been doing to convert to the needs of peace the great fleet it built for war has not been in the spotlight. The conversion of coal burning steamships into oil burners has attracted no more attention than has the quiet establishment of these stations for supplying them with fuel.

To-day this nation possesses a fleet of 486 oil burning steel steamships representing 3,798,733 deadweight tons of new construction. In addition there are 49 freighters of the oil burning type which have been reconveyed by the Shipping Board to their American owners, and still another group of 18 which have been sold by the Board and which are under the American flag. Of the 720 steel vessels under construction and contracted for, 636 are oil burners, these aggregating 4,691,659 deadweight tons. When the steel program has been completed there will be a total of 1731 of the oil burning type under the American flag.

IMPORTS OF GREAT BRITAIN.—Our new merchant marine was a by-product of the war and its creation brought with it this problem of bunker facilities, one that demanded immediate consideration, for upon its solution depended the success or failure of our re-entry upon the seas. Great Britain's control of the supplies of bunker coal along the main trade routes of the world has been one of the chief factors in the maintenance of her maritime supremacy. The other lies in the fact that the imports of Great Britain consist largely of produce and raw materials requiring a large amount of tonnage and that the British use coal for the outward voyage.

Coal does not command a high freight rate, but by carrying this product on their outward voyages, British ships are able to bring back raw materials at a rate that shows a profit for the round trip. After being worked into finished products by British labor, these imports are exported in British bottoms at rates remunerative to the ship operators, and so the cycle goes.

With the United States, shipping conditions are practically the reverse. The bulk of this Nation's trade comprises exports rather than imports; moreover, the goods moving in the export trade have been of a greater value than coal, and have borne a higher rate of freight. This American coal has not had a ballast value comparable to that of the British product.

With Shipping Board fuel stations established on the important trade routes, the enormous advantages which this fleet of oil burners will possess, may be summarized as follows:

Oil requires less bunker space than coal for a given steaming radius. It can be carried between double bottoms and in other places where

neither coal nor cargo can be stored. The space usually given to coal can be occupied by freight-paying cargo. Bunkering can be effected with greater dispatch, and is not interfered with by darkness or the state of the weather. It is not attended with the dirt and other discomforts incident to coal bunkering. Labor and machinery are not required for handling ashes. Oil fuel eliminates stoking, thus reducing the size of the crew and labor costs. It possesses greater thermal efficiency than coal and reduces fuel costs. Uniform steam pressure easily maintained, thus insuring a steady rate of speed and reducing the deterioration of furnaces and boilers resulting from uneven temperature.

The total requirements for the United States merchant marine in 1919 have been estimated at 31,000,000 barrels.—*United States Bulletin*, Nov. 10, 1919.

CHANGE OF ZERO OF THERMOMETERS.—In consequence of a "change of zero" with age, the readings of mercurial thermometers frequently become too high and those of spirit thermometers too low. The former effect, says Mr. F. J. W. Whipple, a well-known English authority, is due to a gradual shrinkage of the bulb, which forces the mercury up the stem. Various reasons have been suggested for the opposite effect in spirit thermometers; it has been thought that the thin film of liquid "wetting" the interior of the bore was sufficient to account for the errors found in tests, and that standing the thermometers with the bulb downward for a long time would always get rid of the discrepancies (as it certainly does in some cases). The vapor of the spirit has been supposed to enter into chemical combination with the glass or to make its way through it by way of invisible cracks. Mr. Whipple believes there is a simpler explanation. Mercury thermometers are sealed off when almost filled, so that they contain practically no air, and as the pressure inside the bulb is less than that outside the strain tends to make it shrink. Spirit thermometers, on the other hand, are sealed with the bulbs in a freezing mixture, so that they may contain as much air as possible, a condition which is said to reduce the trouble due to evaporation. Consequently such thermometers have high pressure inside the bulbs as compared with the pressure outside, and hence there must be a tendency of the bulbs to expand, so that the readings become too low and positive corrections are required.—*Scientific American*, Dec. 20, 1919.

## AERONAUTICS

HELIUM PRODUCTION PLANT ERECTED IN TEXAS.—A large helium plant has been erected at Fort Worth, Texas, and this is of vital importance in lighter-than-air craft, as the exploitation of helium as a flotation agent for dirigible balloons has been a most interesting war development. This gas, formerly very rare and expensive, is nearly as buoyant as hydrogen and less combustible than asbestos. It is the one unique balloon-filler known. Fortunately, it exists in workable quantities in the natural gases of north Texas.

The helium plant is, as the name suggests, for the production of helium commercially. The work will cost, when completed, approximately $5,000,000. The plant takes the natural gas, from which helium is extracted, through a pipe line 96 miles in length. The production of 40,000 to 45,000 cubic feet per day is contemplated.

This output is to be distributed to the various air stations in steel cylinders, each having a capacity of 180 cubic feet of free gas. Such a capacity is thought to be sufficient to furnish supplies of helium to our entire dirigible fleet as needed. A study is now being made of an additional stage in the refining plant to repurify used helium after diffusion has occurred in use, which should result in a very desirable economy.—*Aerial Age Weekly*, Dec. 8-15, 1919.

NAVAL AVIATION AN INTEGRAL PART OF THE SERVICE.—The Atlantic flight emphasizes the necessity of developing aviation as an integral part of our military and naval forces. When an airship can fly from Europe to America in a few hours, the ocean is no longer a dependable protection against possible attack. Civilian aviation should be given every possible encouragement, but naval aviation, to be effective, must be moulded into the naval service, of which it is a vital part. *For this, special training is required, not only in methods of fighting and patrol, but also in naval training to insure that complete understanding between all parts of the force employed, that mutual knowledge which is a prime requisite in all military operations.* Our aviation force must be made a part of the fleet as well as an effective coast patrol—capable not only of operating from shore, but also at sea, accompanying our ships wherever they may go.—*Aerial Age Weekly*, Dec. 8-15, 1919.

ELECTROSTATIC EFFECTS ON AIRSHIPS.—Mixtures of hydrogen and air in proportions between certain limits may be exploded by a minute electric spark. Such mixtures may occur near any opening such as a valve of an airship from which hydrogen is being emitted into the air. Sparks may pass from one part of an airship to another or from airship to a cloud, or to the ground, if electric charges are acquired which produce sufficient differences of potential.

As a result of the electric field near the surface of the earth—from 50 to 200 volts per metre—the difference of potential between points at different heights above the surface may be very great. The charges induced on a conducting balloon depend upon the electric field in the region before the arrival of the balloon and upon charges induced on nearby conductors because of the disturbing effect of the balloon; therefore, the sudden transference of a balloon from a region of high potential to one of low, will not change the charges on the balloon, provided the strength of the field is unchanged and provided the balloon is not brought near a conductor. The maximum field around an originally uncharged spherical balloon is three times the strength of the field into which it is brought, if no conductors are near; the maximum field between such a balloon and the flat surface of the ground just before contact is made is five times the original field; protuberances, especially sharp points, projecting from the balloon will have a greater field immediately around them than that stated above, increasing with the sharpness and the distance they project from the main surface of the balloon; but except during an electric storm and when a balloon approaches a highly charged cloud, the field around any balloon due to charges induced on it will be too weak to cause sparks.

If the speed of an airship is sufficiently great, rubberized cotton fabrics become negatively charged, while rubberized silk fabrics become positively charged. The intensity increases very rapidly with the speed, approximately as the sixteenth power. The effect depends chiefly, if not wholly, on the solid and liquid particles held in suspension in the air; dust and water particles seem about equally effective; with ordinary air the effect is small for speeds below 60 m. p. h., but in the case of smoke or mist large effects may be obtained with 40 m. p. h. The effect is associated with impact rather than with skin friction.

*Danger from Sparks Between Various Parts of an Airship.*—If the fabric and ropes are conducting, the only danger is that due to the rubber rings around the valve seat, which may become charged by the outflowing gas and cause a spark to pass through the gas to the valve. It would be a wise precaution to connect the valve and the seat by a wire firmly fastened to each.

*Danger from Sparks to Ground on Landing.*—Since the airship may become highly charged as a result of motion through smoke or mist, the difference of potential between it and the earth as it descends may be

sufficient to cause a spark. To avoid danger the landing rope should be a fairly good conductor.

*Danger from Sparks to a Charged Cloud.*—If the balloon chances to be in the path of a lightning flash between earth and cloud, it will probably be destroyed; but since the electric capacity of the balloon is small, a spark between it and a cloud can be prevented by relieving the electric tension by means of discharging points located as far as possible from explosive mixtures of gases. A sharp point or crown of points made of non-corroding metal, projecting above the dorsal fin of the airship and connected by wire to the steel framework of the fins, would eliminate most if not all of the danger.

The following recommendations are made:

1. It is desirable that the outer surface of the balloon envelope should be conducting so that dangerous differences of potential between the various parts may be made impossible and so that the balloon may be rapidly discharged before landing.

2. That the inner surface of the envelope should also be conducting to prevent dangerous differences of potential from being produced by the friction of one surface upon another during inflation.

3. That, for similar reasons, the ropes suspending the car and especially the landing rope should also be conducting and that the latter should be so well connected to the envelope and other parts of the airship as to insure the rapid discharge of the airship before landing.—*The Technical Review*, Nov. 25, 1919.

ENGLAND TO SPEND $75,000,000 A YEAR FOR MILITARY, NAVAL AND CIVIL AERONAUTICS.—*Construction of Large Airships Stopped.—Over 250 Aviation Fields Returned to Cultivation.*—England, following the example of the United States, France and Italy, has cut down her air program considerably, but her appropriations are still much greater than the appropriations allowed for the U. S. Army, navy and post office, although the actual number of squadrons planned for the British military and naval establishments are surprisingly few.

The high figures for so small a number of aero squadrons are explained in the statement that a large sum is to be spent in establishing aerodromes in the colonies and is, therefore, to be spent on general aerodrome buildings, construction and equipment and not for aircraft.

It is noted with regret that the British Government has abandoned the project to build large dirigibles and that the dirigibles of ten million cubic feet hydrogen capacity may not be constructed.

Also that over 250 military aviation fields have been turned back to cultivation during the past six months, although we appreciate that owing to her small size England is forced to utilize all the land available for the production of food.

Winston Spencer Churchill, who at present is both Secretary of War and Air Minister, in charge of military and naval aeronautics, has prepared a plan for the Royal Air Force organization in peace time based on the expenditure of £15,000,000 ($75,000,000) yearly. The main outlines of this plan, which was announced on December 13, provide for one flight squadron for each division of the army to co-operate with the troops in all stages of their training, besides three general service squadrons, and also one or more squadrons for co-operation with the artillery.

The fleet will have permanently three aeroplane squadrons and two seaplane squadrons. India will have eight service squadrons, Mesopotamia three and Egypt seven, while the naval bases at Malta in the eastern Mediterranean and probably Alexandria, will each have one small seaplane unit.

A report dated November 6, made to the House of Commons by Major General Seely, of the British Air Ministry, stated that the Air Ministry had

given up, since the signing of the armistice, 252 aviation landing grounds as follows:

(a) Stations consisting of land only (*i. e.*, landing grounds and camping grounds) ..... 124
(b) Stations consisting of land and buildings (including ten transferred to other departments) ..... 122
(c) Stations at which aerodromes have been released, while buildings are still required for Royal Air Force purposes..... 6

Also regrettable is the decision of th Air Ministry to dispose of the dirigible stations, including the East Fortune Station, where *R-34* was stationed when it started for the historic Transatlantic flight.—*Flying*, December, 1919.

TO TEST NEW TYPE OF SMALL PLANE.—Interest of fliers in Washington has been aroused in a new type of plane now at the Navy Air Station, Anacostia, D. C. This miniature monoplane is called the Loening Kitten, It has a wing spread of only 10 feet and length of 8 feet over all. It is supplied with a three-cylinder Anzani motor of 45 horsepower. The plane is being prepared for test under conditions simulating taking off from the gun platform of a ship.—*Army and Navy Journal*, Dec. 27, 1919.

THE HELICOPTER.—Inasmuch as the helicopter is purposely designed to rise straight up and to descend perpendicularly, it would be able to start away from any moderate space, such as a roof, an ordinary street, or the deck of a vessel, and alight upon the same spot on returning from a flight. This would permit the machine to operate under atmospheric conditions and in relation to a terrain which would invite catastrophe in the case of an airplane. The helicopter, with the anticipated deliberate movement in nearing the ground, could maneuver for a favorable landing place, and do this night or day, in fog or snow, and ascend again after getting within a few feet of earth or water, if such a course were essential to safety.

When aloft, the helicopter could hover over a given spot, whereas the airplane, to effect sustentation, must maintain a high rate of speed. By means of suitable rudders or small planes, the helicopter could be directed horizontally and likewise tipped up or down on the longitudinal axis of its fuselage. If inclined a few degrees toward the head the machine should move forward in a horizontal plane, and if similarly tipped by the stern it should move just as fast in that direction. This is because the propellers when canted from the vertical exert both a sustaining and a propelling force.

With all these advantages awaiting the helicopter that will work, there is every reason to encourage the engineers who are bold enough to turn to this rather discredited type of aircraft, and to hope that the conclusion of their experiments may give them as much satisfaction as has the start.—*Scientific American*, Dec. 20, 1919.

THE ACCELEROMETER.—Mr. L. Bairstow in *Engineering*, describes a delicate little instrument called an "accelerometer," by which the forces of an aeroplane can be measured. Although it has a good scientific name it has also the merit of being a very prosaic instrument which measures the heaviness with which a pilot sits on his seat. Ducking the nose of the aeroplane tends to throw the aviator out, and at the moment at which he loses his seat the instrument reads zero. During a loop it may indicate that instead of a real weight of 10 stone, the pilot's apparent weight is 40 stone. His head is then very heavy on his shoulders, and on the one occasion on which I experienced the sensation my head was distinctly unstable, and an incautious movement brought it forward "out of control."

One record made occupied nearly half an hour in the taking, of which about 20 minutes was in the air. The instrument, designed by Dr. Searle,

F. R. S., of the R. A. E., was strapped to the knee of an observer, and at intervals the pilot interposed some of the trick evolutions of flying on the more normal course of the flight. The first clear deduction from the record is the uneventfulness of straight flying, especially at good heights. This is shown by the tendency of the record to keep about the value 1, so that the pilot and passenger have their usual weight. Flying low down it was noticed that the changes called "bumps" sometimes reduce a pilot's apparent weight to half its ordinary value, and at other times increase it to nearly one and a half times. The sensations are very like those experienced on a switchback or mountain railway, and in a well-shielded cockpit this is the only noticeable effect of motion on the sense of feel. The earth, however, becomes far less impressive as the representative of solidity and has its attributes transferred to the aeroplane. So much is this the case that in a loop it is the earth which goes over your head, whilst in a banked S turn the waves of a high sea are less wonderful than the swaying of the earth. These impressions are very real, and have a rational basis; we are so accustomed to living on the earth and to the use of such instruments as levels that it needs a definite effort to realize that on an aeroplane a level does not indicate the horizontal. On the contrary a level will consistently say horizontal when the aeroplane is banked to 45° or more, and not only does the level say this, but the pilot's sensations of feel tell him he is sitting upright. In the absence of side-slipping the local level is given by the wings of an aeroplane. With an horizon visible a pilot can keep level relative to the earth by the use of his eyes, but this power is removed by immersion in a cloud. By the use of instruments of a not very intricate nature straight flying can be conducted in a cloud, and fog is not by any means an insuperable bar to aerial navigation.

Leaving the record of ordinary flight and coming to the "stunts" it will be found that on two occasions the pilot was in danger of leaving his seat, and the importance of a belt will be appreciated. Looping and spinning produce heaviness on the whole, the extreme value being nearly three times the normal. A rapid turn almost always increases the apparent weight, and in a nock flight it is very noticeable that the greater number of manœuvers seat the pilot more solidly, and therefore help in the accurate control of the aeroplane's motion. In a few instances and for a few seconds the apparent weight is zero, whilst the extreme in the other direction is as great as four times the normal.—*The Army and Navy Gazette*, Oct. 25, 1919.

## MISCELLANEOUS

THE LEAGUE OF NATIONS AND AFTER.—It is clear now that the League of Nations was a gamble, to which Great Britain could never have been a party had our statesmen any real knowledge of the United States. American constitutional practice and traditional neutrality may alter, but not at the bidding of an idealistic autocrat with a political axe to grind. To have accepted the Peace Treaty as it is America would practically have admitted that she was a European power, which she is not, and never can be. Therefore, through the Senate, she repudiates President Wilson, who assumed that his will was her will at the Versailles Conference. The immediate consequence is that she declines to become a party to the League of Nations, which he induced the Allies to incorporate in the Peace Treaty on the plea that if they did not the war would have been fought in vain. Moreover, all the nations, Germany not excepted, were to join the League, the Executive Council of which was to be invested with responsibility for part of the settlement under the Peace Treaty. But without the United States the whole fabric of illusion falls to pieces, and Britain, France and Italy are faced by the terrible realities of post-war Europe. They have quickly accepted the new situation, and acted upon it, by reviving what is virtually the balance of power. The recent conference in London,

at which the representatives of those nations, together with the Japanese Ambassador, took the place of what has been known as the Supreme Council, was more important in many ways than any which has before taken place since the armistice. That the American Ambassador was present is a sign that the United States has no intention of abandoning any of the responsibilities she shouldered by entering the war. But that the deliberations were based on a probable League of Nations is highly improbable. To the military student it is obvious that, in present circumstances, an alliance between Britain, France, and the United States is not a practical proposition because America is too remote from Europe. What will most likely emerge is an alliance between Britain, France and Italy, three powers whose most vital interests are bound up with the continent to which they belong, and in which they constitute the most valuable bulwark of peace. All the would-be creators of a new world by the spoken or written word have done is to make conditions in the existing one more difficult and complicated than they need have been.—*The Army and Navy Gazette*, Dec. 20, 1919.

HOUSE ARMY PLAN.—The House Military Sub-committee, headed by Representative Daniel R. Anthony, Jr., of Kansas, has decided on a peace-time army of 300,000 men and 18,000 officers during the course of its action on the army reorganization bill. The extra officers, it is proposed, will be used as instructors for National Guard and R. O. T. C units.—*United States Bulletin*, Dec. 15, 1919.

NAVAL CASUALTIES ANALYZED.—The figures and deductions presented by Sir Robert Hill, the medical director-general of the navy, in his address to the War Section of the Royal Society of Medicine are interesting, even if they do not throw much light upon problems of naval design or strategy. The historical portion of the address showed how inadequate was the organization for dealing with casualties in the old wars. There were no sick berth attendants until 35 years after Trafalgar, and at the time of that battle the sick were messed in their sleeping quarters, having no special place set apart for their treatment. Moreover, the old-time surgeon, with his lack of proper facilities, had yet to undertake all operative work on board his ship, whereas nowadays a naval surgeon does not perform any major operation on board, steam and antiseptics having entirely altered the situation. The figures of loss in the ships at Jutland again emphasize the drastic nature of casualties when a ship is sunk. Every soul on board the *Indefatigable*, *Defence*, and *Black Prince* perished, and of the 2284 on board the *Queen Mary* and *Invincible* only seven were saved. The deadly nature of modern fighting is amply shown by the fact that in an action which the Germans broke off after the preliminary stages, and in which only portions of the opposed fleets were engaged for more than a few minutes at a stretch, the percentage of British casualties to the total force employed, 11.14, was greater than at Trafalgar (9.51), which both sides fought to a decision. It would have been interesting if Sir Robert Hill had similarly analyzed the heavy casualties sustained in the futile affair at Zeebrugge, which, unlike Jutland—by which the result of the war was ultimately determined—had no real influence on the course of hostilities.—*The Army and Navy Gazette*, Nov. 29, 1919.

SKODA WORKS TO MAKE MACHINERY.—The great Skoda plant in Bohemia was to resume full operation on Jan. 1, according to a dispatch from Berne, Switzerland, where the head of the factory had been staying. Although rifles will be manufactured in the future no more artillery nor machine guns will be a part of the product of the plant.—*Army and Navy Journal*, Jan. 3, 1920.

GERMANY BUILT OVER 800 SUBMARINES.—Vice Admiral Von Capelle, former Minister of the Navy, recently told the Assembly Committee that

810 submarines were built by Germany before and during the war. Of these, 45 were built before the war, 186 during the administration of Von Tirpitz, and 579 were built under the Capelle administration of two and one-half years. Asked what was the exact purpose of the submarine campaign against England, the Admiral said that he had believed that by unrestricted use of these craft he could force England to a "usable peace" within five months' time.—*Scientific American*, Dec. 6, 1919.

PROPOSED NEW SHIP CANAL.—It is proposed to construct a ship canal in the Bay of Jamaica, at the extreme southwest of Long Island, U. S. A. It is to be 1500 feet broad and 30 feet deep, with an interior canal 1000 feet broad.—*The Engineer*, Dec. 19, 1919.

DESTRUCRION OF GERMAN SHIPS.—The Supreme Council to-day decided to order the destruction of all enemy warships except those turned over to France and Italy in compensation for their war losses. The Council also discussed distribution of materials and docks to be delivered by Germany as compensation for the sinking of the interned German fleet at Scapa Flow.—*Shipping*, Dec. 17, 1919.

ENGLAND PRAISES OUR ARMY AND NAVY.—Announcement was made by the State Department on Jan. 1 of the receipt of the following address signed by all the lord mayors, lord provosts and mayors of cities and towns of Great Britain and Ireland, according to a press dispatch from Washington: "To the people of the United States of America: Be it known by these presents that we, the undersigned lord mayors, lord provosts and mayors of the undermentioned cities and towns in Great Britain and Ireland, while rejoicing that with the co-operation of the American Navy and Army and that of the Allies the war has been brought to a victorious conclusion, do hereby declare, on behalf of the people of these islands our deep regret at the consequent departure from among us of the American naval and military forces who have fought side by side with our soldiers and sailors with so much gallantry and success. We are sorry that we in this country have not been able to welcome as many of the American land forces as we should have liked, owing to the exigencies of war. Those of your men, however, who have resided with us have made countless friends among our people, and we shall always retain the happiest memories of their visit. The standard of conduct they have set has indeed been a high one, and we can only say that we hope they will take away with them some of those feelings of affection which they have inspired during their sojourn with us."—*Army and Navy Journal*, Jan. 3, 1920.

LENGTH OF LINERS AND WARSHIPS.—The stay of the battle-cruiser *Renown* in our waters has raised a discussion as to which are the longest ships afloat. Of course, among merchant ships, the *Leviathan*, 950 feet long, is the longest, with the *Imperator* and the *Aquitania*, each 900 feet long, of the Cunard line, coming next. Among warships, the longest in commission to-day are the *Renown*, and her sister, the *Repulse*, each being 789 feet. But the longest warship constructed and soon to go into commission, is the British battle-cruiser *Hood*, which is 900 feet in length and about 42,000 tons full load displacement. Our Navy Department has designed six battle-cruisers 875 feet in length.—*Scientific American*, Dec. 6, 1919.

WORLD'S LARGEST SUBMARINE.—Hansa gives the following details concerning the surrendered *U-142*, which is claimed to be the largest submarine in the world. This submersible-cruiser was completed last year in the Germania Yard at Kiel, and is 320 feet long and 31½ feet wide, with a displacement of 2785 below and 2158 tons above water. Surface pro-

pulsion is by two six-cylinder Diesel motors, each of 3000 horsepower, and one motor of 530 horsepower, yielding a speed of 18 knots. These Diesel motors are claimed to be the largest units yet employed in ships, the next largest being the 2500 horsepower units of the American transport *Maumee*. When submerged the two 1300 horsepower electric motors of the *U-142* yield a speed of 8½ knots. The oil tanks accommodate 450 tons, corresponding to 20,000 knots at 6 knots. A crew of 83 is carried, more than half being engineer ratings. The armament comprises six torpedo-tubes, 19 torpedoes and two 15-cm. guns.—*The Nautical Gazette*, Dec. 6, 1919.

HYSTERIA AMONG THE ADMIRALS.—What else can we call it but hysteria when Admiral Sir Percy Scott says: "The battleship is dead. . . . . Battleships were dead before the war, and I think they are more dead now. . . . . The battleship waddles along at 20 miles an hour and cannot waddle far. . . . . When a battleship nears the end of her coal and ammunition supply she must waddle home, and it takes several hours to refuel her, even if she uses oil. An airplane will return at 100 miles an hour, and takes only three minutes to load again." And if it were anyone but Lord Fisher, we should put it down to hysteria that he has written six letters to the *London Times*, and a whole book, to prove that pretty well everything in the British Navy, whether afloat or ashore, is wrong—except the gallant Admiral himself.

But we are not concerned so much with Lord Fisher's diatribes. Those who are interested in the brilliant, eccentric, over-masterful and choleric old sea dog can find much interesting naval gossip in surely the spiciest book ever written by an admiral, British or otherwise. Iago said he was "nothing if not original," and Fisher is nothing if not explosive. As to the good taste of his wholesale denunciation of his brother officers in the same breath in which, by indirection, he extols his own infallible genius, there will be but one opinion, both inside the navy and out.

Admiral Scott says that battleships were dead before the war, and he thinks they are "more dead" now. It will be remembered that in 1914 he made the same statement. Six years have passed since then, and five of them witnessed the greatest series of naval operations of all history. So far from the battleship being dead, in our opinion it was never so much alive as it is to-day. It was the silent stranglehold of a navy whose strength, in the last analysis, lay in its fighting line of dreadnought battleships, which was one of the principal contributing causes of the overwhelming defeat of the enemy.

Admiral Scott thinks that the battleship has already given way to the airplane. "It takes a battleship," he says, "weighing 30,000 tons to carry 100,000 pounds of high explosives. Ten airplanes of three tons each could carry the same amount." But so far from the airplane having destroyed the value of the battleship, it is a fact that in all of those five years of war, not once was a battleship destroyed by an airplane, and not once did an airplane even hit a battleship that was under way.

As a mater of fact, the evidence in the case points all in the other direction. That is, it shows how completely ineffective is airplane attack in sinking or seriously disabling the battleship. Proof of this was seen at the Dardanelles, when the airplane had the chance of its life in attacking the heavily armored battle-cruiser *Goeben*. The conditions were ideal for the airplane, and the worst possible for the cruiser, for the *Goeben*, in entering the Dardanelles had run aground, and therefore could not maneuver. So, the flying men had everything pretty much their own way, and theoretically they should have bombed the *Goeben* to pieces. As a matter of fact, the ship was subsequently floated and returned through the Straits to Constantinople at 15 knots, under her own steam.

The case for the airplane or the airship as a substitute for the battleship would be fairly strong, and the statement of Admiral Scott would be less preposterous, if the aiming of bombs from an airship had anything

of the accuracy of the projectiles thrown from the heavy guns of a battleship. But so far as accuracy in hitting an object the size of a battleship is concerned, the airplane bomb is about the most inaccurate of all the missiles that are known to the modern art of ballistics. As an airman once said: "It is really astonishing how much you can miss from an airplane." In regard to its inaccuracy, or rather the inaccurary of the aiming, the airplane bomb is in the same class with the torpedo. Both the bomb and the torpedo are remarkably accurate weapons if they are launched at the proper angle with relation both to the speed of the firing craft and of the target at which they are aimed. The public may be excused for drawing inferences from the ease with which a huge mark like a city can be bombed, overlooking the difficulty of hitting a definite mark like a particular building on land or a particular ship at sea, from the height of 15,000 to 20,000 feet to which the attacking aircraft are forced by the accuracy and volume of anti-aircraft fire.

The battleship may "waddle" to use the admiral's poetic term, and it is true that on exhausting its fuel and ammunition supply it must return to port at but 20 knots' speed, while the airplane can return at 100 knots. But he omits to state that the battleship can waddle from five to ten times as far as the airplane on one filling of its tanks and bunkers. No. We can see no reason to suppose that the airplane is destined to be a cheap "kill-all" in naval warfare any more than the torpedo boat, the submarine, the so-called dynamite gun, or any other of the sensational inventions which have shown themselves above the horizon down through the past 50 years. Each of these in its turn has settled down to take its proper part in the great, diversified and complicated scheme of naval warfare. The airplane will supplement but it will not suppress the battleship. Already it has proved its value as an aid to the battleship in the two most important fields of scouting and spotting. The British have got the right idea in building their *Argus* mother ships, big, broad-platformed vessels, capable of going anywhere, nesting from 20 to 30 airplanes below deck and able to send them out hundreds of miles ahead of the fleet to get early tidings of the enemy's location, disposition and strength. As an aid to modern gunnery in spotting the fall of shot the airplane will prove to be simply invaluable, particularly in these days of 16-inch and 18-inch guns, with ranges of from 20 to 30 miles.

So far from rendering the battleship obsolete, the airplane, because of its superb scouting and spotting possibilities, has prolonged the era of the battleship and rendered it even more efficient than before.—*Scientific American*, Dec. 6, 1919.

THE HISTORY OF A GREAT INVENTION.—Very characteristic of the development of many successful inventions is the story recently told by Admiral Jellicoe of the incident out of which sprang the greatly dreaded depth bomb—a weapon that was mainly responsible for the defeat of the submarine.

It seems that early in the war a fast British cruiser, on sighting a submarine on the surface, dashed for the enemy at full speed in an attempt to ram her. The submarine submerged just in time to escape the blow, and the officers and crew of the cruiser were chagrined to realize that, although they could clearly see the submarine below them as they swept over her, they were unable to do anything to damage or destroy her.

One of the officers of the ship, on narrating the incident exclaimed: "If I had only possessed some form of bomb which I could have dropped on the enemy, we could have destroyed her." This led to the construction of various devices, one of which was the so-called submarine dart, consisting of a high explosive shell with a shaft attached for throwing it. The trouble with this and any similar form of direct-contact shell was that it was only once in a very long while that a charging cruiser or destroyer passed immediately over the submerged enemy ship. When she made

her rush she got near, of course, but seldom near enough for a direct hit with a shell or bomb.

The next step, then, was to aim at the destruction of the submarine by means of a heavy concussion, transmitted through the incompressible water from a bomb detonated below the surface and in the vicinity of the submarine. Then followed the cylindrical-shaped bomb with its fuse set to function by hydrostatic pressure at any desired depth. From 60 pounds' weight, it rapidly rose to 200, 300, and, at the close of the war, the charge was 600 pounds, this last a bomb that would destroy any submarine within a 170 feet of it and was almost certain to disable one at 300 yards.—*Scientific American*, Dec. 6, 1919.

GERMAN DEFIANCE OF THE ALLIES.—On so many occasions in these columns have we called attention to the fact that Germany had not really disbanded its army, or given up the idea of millitary aggrandizement, that our readers will scarcely be astonished that independent observers in neutral countries who are closely in touch with currents of German opinion, have come to the conclusion that the German Military Party is deliberately preparing for armed action against the Allies. The disquietude prevailing in Berlin is referred to in all reports concerning the demonstrations attendant on the reappearance of Hindenburg and Ludendorff in the capital. That the combustible material accumulating in the German capital will take fire some day is attested by many independent observers. The *Times* states that there are now some 700,000 men under arms in Germany, whereas the Peace Treaty allowed them 200,000 only. In addition there is good authority for stating that Herr Noske has for some time past been busily organizing a special "police" force of picked men, well armed, ostensibly as a protection against the Spartacists. Several thousands of these men recently marched in columns of four through the streets of Berlin. They carried arms, bags of hand grenades, and were accompanied by machine gun detachments. They are understood to have been recruited mainly, if not entirely, from the non-commissioned ranks of the German Imperial Army. Similar forces of "special police" are stated to exist in all the large German cities. The total number already organized, or in course of organization, is estimated at 300,000 men. They constitute a formidable force and are thoroughly disciplined. Hindenburg's visit to Berlin was evidently used as a "feeler" to test the popular attitude towards a revival of "militarism"—which means the reincarnation of the German Army with the object of again plunging the world into war and deluging the countries with blood. There are many hundreds of thousands of men in Germany ready equipped for fighting, and if a "coup d'état" were to be carried out, the situation would be far from an easy one for the Allies to handle, especially in view of the fact that most of the German prisoners have been repatriated and have arrived home in prime condition thanks to the humanity of their captors. It will be necessary to keep the most vigilant watch over the execution of the Treaty Clauses which prescribe the number of troops Germany is to retain. There is no sign whatever in present events of her preparing to fulfill her pledges in this particular. The British Premier in a recent speech showed that he at any rate is not blind to the situation. It is clear that the public in our country—and in all the Allied countries—should be more fully supplied with the facts known to the Governments, so that there may be no lack of intelligent support of such measures as may be needed.—*United Service Gazette*, Nov. 27, 1919.

REVIEW OF THE YEAR, 1919.—*The World Crisis.*—Twelve months ago we were rejoicing that the end had come to the great war of arms, and with glad hearts we took the sickle in hand to reap again the rich harvests of peace. To-day, the clouds of disillusionment lie broad and heavy upon the world; for the clash of arms has been succeeded by a great clamor of

many voices, among which are heard the shoutings of fear, suspicion, prejudice and hatred. Nevertheless, we are sufficiently optimistic to believe that the world has reached a stage of education and broad enlightenment, upon which no such general chaos and revolution as the more timorous of us have predicted can ever take place, certainly not in America. Students of history are well aware that every great war has been succeeded by a period of high costs of living and great industrial unrest. If the good sense of the majority and the unchangeable laws of economics have served to carry the world through similar crises in the past, when education and information were not so widely shared, we have every reason for confidence that all of the great peoples will weather this industrial storm and settle down to an era of steadily increasing prosperity. An attitude of reasonableness on the part of labor, of generosity on the part of capital, and a substitution of confidence for distrust will surely dissipate the gloom and let in once more the sunlight of former days.

But who shall start the world on its upward way? The Senate of the United States has it in its power, by the acceptance of the Peace Treaty, to reverse the tide of human affairs overnight.

*Engineering—Electrical, Hydraulic, Etc.*—Although, in the broad field of engineering, the past year has no record of startling achievement, it is certain that, when the deadlock in the world's affairs due to our Senate has been broken, some works of magnitude will be undertaken. Here in the United States we have entered upon the extension of our transit facilities, particularly in the city of New York. The necessary legislation has been secured for building a large vehicular tunnel beneath the Hudson River to provide for the ever-increasing stream of automobile and motor truck traffic. It is realized that the question of ventilation is fundamental, and the final plans will be drawn so as to secure at all times an ample volume of fresh air, with a minimum content of poisonous gases. The Channel tunnel is to be built. The last objection, which was a military one, has been removed, for under the new conditions of friendship between France and Great Britain, the tunnel, in the event of future military trouble, would be of priceless value for the rapid conveyance of troops and munitions. France and Spain are co-operating in a scheme to pierce the central Pyrenees with a tunnel 17,566 feet in length, thus adding a third connecting line of rails between the two countries. In the matter of water transportation, it is gratifying to know that the Panama Canal is fulfilling every expectation. Over 5000 vessels cleared at each terminal during the 1919 fiscal year. The huge slides at Culebra have reached a natural angle of repose; Gatun Lake has proved ample to supply the demands of lockage, and the whole vast scheme, including the operation of the locks and the wharves and docks at their terminals is functioning most satisfactorily. It was a banner day in the history of this enterprise when the Pacific fleet, including four divisions of dreadnoughts or fourteen ships in all, passed through the Canal from the Atlantic to the Pacific without a hitch. The New York State Barge Canal, the greatest inland waterway of its kind, is completed with the expectation of dredging out to full depth on some stretches where silt has accumulated. The equivalent of about 200 standard barges is now in operation, and the realization of the full benefits of the canal simply awaits the construction of terminals and of a sufficient number of barges.

With the return of normal conditions, some greatly needed bridge construction will be carried out as part of various schemes of improved transit. Had it not been for the war, the Hudson River bridge, with its 3000-foot span, would have been under construction. Good progress is being made in the construction of dry docks of adequate size, particularly for the navy. After enormous difficulties, the Pearl Island dock, with a length of 1000 feet, a width of about 114 feet, and a depth of 32½ feet, has been completed. This will prove to be a work of great strategical value. In addition, the navy is now possessed, or soon will be, of some

half dozen docks each a thousand feet in length, including the great Commonwealth dock in Boston. A notable engineering event of the year was the celebration on August 25, 1919, of the James Watt Centenary, and it is significant of the advance made since his day that there was put in successful operation this year at one of the big transit power stations (at 74th Street, New York) a compound steam turbine, having a total output of 100,000 horsepower. In railroad engineering there has been a steady increase in the size of units. Thus, the Pennsylvania Railroad recently exhibited a Mallet locomotive weighing 800,000 pounds, of which 580,000 pounds represents the weight of the locomotive. Coal cars have gone up to 210,000 pounds' capacity, and other rolling stock in proportion.

Very impressive has been the advance of electrical engineering. So vast are its ramifications that it may be said to lay its hand upon all engineering. The water turbine is but handmaiden to the electrical generator; a Panama Canal calls upon electricity to operate its lock gates and haul the shipping through the lock chambers; it has monopolized the mariner's compass and it bids fair, some day, to be running most of his ships.

Electric engineering work has been very largely held up by the exigencies of the war, but we have seen in the country the completion of a great dam at Maryville, Tennessee, which will yield 80,000 horsepower. Its height from the foundation to the crest is 225 feet. The ambitious scheme for developing the full head of water between Niagara and Lake Ontario by the construction of a canal along the Canadian shore of the river is being put through. The hydraulic electric plants at the falls utilize only about one-half of the head. Those at the end of the canal will use practically the whole head of about 300 feet.

*Industrial Science.*—In the field of applied science, the past year has been one of tendencies and development rather than of outstanding achievements that can be cited by name and date. Thus, as an aftermath of the war, 1919 will go down in the records as the year of the application of the gas mask in scores of hazardous occupations. It will be remembered as the year in which were first recognized the full possibilities of determining the physical properties of metals through magnetic analysis, without destruction of the parts tested.

At the same time, the chemist will record the year just past as the period in which an almost equal degree of fineness in analysis was made general by the use of the microscope in studying the crystal structure of samples. He will also localize in this twelve months the formal recognition of the tremendous part played by colloids—almost infinitely divided substances, the diametric opposite of crystals—in the processes upon which many of our industries depend, and the consequent improved control which he has acquired over these processes. He will probably fix upon 1919 as the dividing line between the laboratory and the commercial stages in the fixation of atmospheric nitrogen.

*Naval.*—The opening of the present year found the United States Navy in an exceedingly strong position relatively to the other navies of the world. A comparison of dreadnought strength showed that, if the present building programs of the various powers are completed, the United States will be stronger than the combined forces of the next three great naval powers. We shall possess 19 dreadnoughts as against 21 for Japan, France and Italy combined. Great Britain, of course, because of her superb shipbuilding effort in the great war was stronger than ourselves; but in agreement with the sugestions of our president, all of the great naval powers, except possibly Japan have ceased capital ship construction and are merely completing some of the lesser units which were partially completed during the war. Great Britain has got rid of all her pre-dreadnoughts and armored cruisers, some of her earlier battle-cruisers, and is seriously contemplating the striking of her early 12-inch gun dreadnoughts from the list. The United States, the protagonist of disarmament at the Peace Conference, is the only navy that is increasing its naval forces, and this

she is doing to the extent of building 18 battleships and battle-cruisers. The Naval Board has recommended an additional three capital ships, making 21 in all. The trials of the dreadnought *New Mexico*, our first battleship to be driven by the new electric drive, were a great success. In addition to the admitted advantage of easy controlability, the ship has already shown herself to be superior in economy to our battleships using the reciprocating engine and steam turbine drive. This makes it fairly certain that the electric drive will be the drive of the future for all of our vessels. The British seem well satisfied with their mechanical reduction gear which is being utilized for the transmission of over 37,000 horse-power on a single shaft. Our new 43,200-ton battleships known as numbers 49 to 54, with 684 feet overall length, have the enormous beam of 106 feet; they will carry twelve 16-inch and sixteen 6-inch guns and have a speed of 23 knots. Our old friends, the battle-cruisers, have been greatly modified. By increasing the beam to 105½ feet, it has been possible to get all the electric and steam machinery below the protective deck without reducing the anti-torpedo protection. Displacement has gone up from 35,000 to 43,500 tons, speed has been dropped from 35 to 33.25 knots, and, we have no doubt that the armor plan has been greatly increased. These changes put our battle-cruisers in the same class as the *Hood*. They will be, practically, battleships with battle-cruiser speed, and will carry eight 16-inch and sixteen 6-inch guns. Speeds have increased in every type of ship. The latest British destroyers have been showing from 37 to approximately 40 knots, this last being achieved by the *Turquoise*, which steamed for four hours at an average speed of 39.6 knots.

The last few months of the year have brought forth some startling statements from high naval authorities as to the future of naval warfare and the composition of naval fleets. Lord Fisher and Admiral Scott believe that the day of the battleship has gone, and that the command of the air will mean the command of the sea. Maybe; but it has yet to be proved. At the same time, it is significant that Great Britain should be directing her energies and her wealth so lavishly toward war in the air. She is building seaplanes of vast size and capacity and although her original airplane program has been modified, it is still very ambitious. The revulsion against the submarine due to German misuse of it has largely subsided, and there is a consensus of opinion among naval men that this type will figure even more extensively in the future shipbuilding programs of the various navies. The type of ship most favored seems to be one of our *S* type, of about 850 tons displacement. Whether huge submarines of the British *K* type of 2000 to 3000 tons displacement and 24 knots' speed will be permanently adopted is a question for the future. They were built as fleet submarines, intended to cruise with the fleet and engage in fleet action. There is the question of the future of high-speed, torpedo-carrying motor boats. The British coastal motor boats, carrying one or two torpedoes on deck, and having a speed of 40 knots, seem to have acquitted themselves so well as to have become popular for work against both destroyers and submarines. On this side of the water we have seen a meritorious attempt along the same lines in the one-man torpedo boat which, because of its low cost and comparative invisibility lends itself admirably to harbor and coast defense.

*Military.*—The record of military achievement of the United States, particularly in the matter of the development and production of military material, has suffered from the fact that what we had accomplished could not be made known until the close of the war. But with the signing of the armistice there came an inevitable and natural falling off of interest in things military; and it is to be feared that the many publications, reports, etc., which have been released by the War Department have failed to produce their full effect because of an audience that was no longer intensely interested. The files of the *Scientific American* for the past year, however, contain a very complete statement of this great work, and it is gratifying

to know that if war should come again (which God forbid!) we shall not be caught unprepared in those branches of warfare which can never be extemporized—we refer to the matter of guns, shells, munition plants and general equipment. Although we could not get much of our army artillery to the front, that is, in time to exert any decisive effect, it is at least gratifying to know that we have to-day stored away and kept in first-class order a vast amount of artillery of the very latest types and most excellent workmanship. As to our future army, it seems likely at the present writing that it will consists of between 250,000 and 300,000 men; but back of that army we have some four millions of men, half of whom have had experience on the fields of Europe, and other half have received a more or less adequate military training at home.

*Merchant Marine.*—After one year of peaceful operation, in which the fruits of our great war effort in merchant shipbuilding have been utilized on the trade routes of the world, America may confidently assert that she has taken her place once more as one of the leading maritime nations of the world. This is one of the first fruits of a war which both depleted the fleets of our competitors and drove us, by the sheer force of necessity, into shipbuilding operations. It is most fortunate for us that the flower of the German fleet was driven by the British cruisers to take refuge in our ports, for we entered the field of foreign commerce with a fleet of first-class ships ready to hand. The vessels which are built and building by the Shipping Board were designed for war service and a revision of plans has been necessary. A large percentage of the smaller ships, including those of wood, have been sold or are upon the market, and the vessels that are now planned will be much larger and of higher speed.

It is doubtful whether for many years we shall see upon the ocean highways any passenger vessels larger than the *Leviathan* and the *Aquitania,* or faster than the *Mauretania,* which holds the blue ribbon of the Atlantic with her speed of a little over 26 knots. Profits do not lie in such vessels, with their huge coal bill and very limited freight-carrying capacity. Until some new form of motive power is introduced, shipping companies will be content with maximum speed of about 20 to 21 knots. Of equal importance with the building of ships is the provision of port facilities. We need to adopt the very latest mechanical cargo-handling devices, and in New York we require a thorough revision of the whole plan and scope of our docks and docking facilities.

*Aeronautics.*—Save for the year in which the Wright Brothers made their first flight in a power-driven man-carrying airplane, the year just passed must rank as the most notable in the era of aeronautics. With all the rich experience of the war to draw upon, the art of peaceful commercial flying was certain to make great strides. First, in the early summer, came the flight of *NC-4* from the United States to England by way of Newfoundland, the Azores, Portugal and Plymouth. The success was achieved through a carefully planned and highly co-operative effort of the navy, which had five battleships and scores of destroyers and tenders strung across the Atlantic. Then followed the amazing flight in less than 16 hours of Alcock and Brown from Newfoundland to Ireland in their Vickers-Vimy bombing machine, driven by two Rolls-Royce engines. These young men had their luncheon in America and their breakfast next morning in Europe. To the same remarkable machine is to be given credit for winning the race from England to Australia, a distance of 10,000 miles, in 30 days. Another epoch-making flight was that of the dirigible *R-34* from England to the United States and back. An event which excited world-wide attention was the great race across the American continent from Mineola to San Francisco and return, made under the auspices of the army. The winner, Lieutenant Maynard, stayed for 48 hours at San Francisco and reached the Atlantic coast again in ten total days of daylight flying. His average speed was about 110 miles per hour. The leading positions were taken by army fliers using the *DH-4,* which is driven by a liberty motor.

A striking development of the year is the great increase in size and power of the large airplanes suitable for bombing in war and for passenger-carrying in times of peace. The Caproni triplane which made a flight from Villacoublay, France, to London with a number of passengers, has been remodeled for passenger service and carries eight passengers, with three additional seats for pilot and mechanicians. The largest Caproni is a triplane which, fully loaded, weighs about 25,000 pounds and is driven by five 260 horse-power engines. This has a double-deck cabin and accommodation for 22 passengers. The Vickers-Vimy has been remodeled and is carrying ten passengers. The Farman "Goliath," which is making regular passenger trips between Paris and Brussels carries ten passengers at a time, and with this aboard has attained a height of 10,000 feet. The Handley-Page four-engined biplane, which was sent to Newfoundland for the trans-Atlantic race, is now in the United States and has been fitted for passenger accommodation. She is credited with having accommodation for 30 passengers. Another huge machine is the Bleriot four-engined machine, with accommodation for 28 passengers. Commercial flying in Europe is well established and showing rapid development. Regular passenger planes make daily trips between Paris and London in between 2¼ and 2½ hours, and there is a service from Paris to Brussels, beside several local services within the various countries.

Here in America, although the work of nationalizing industry makes pitifully slow progress and the matter of governmental assistance is still in the talking stage, the private builders have been doing some very fine work. We hold in the United States the record for altitude, which was won by the Curtiss *Wasp*, a small high-power triplane, originally designed for war work. It has climbed to 34,610 feet, and also it holds the American record of 163 miles per hour straight-away, with full military equipment, including four machine guns. Some excellent passenger-carrying cars have been developed, notable among them being the *Lawson*, a ten-passenger machine and the Curtiss *Eagle*, carrying eight passengers.

With regard to dirigible service, the great risk which these vast machines encounter, when they land upon the ground and while they are there, has been obviated by the use of tall mooring masts, up to which the dirigible noses and makes fast, riding to the wind. In a test carried out under British Army supervision, a dirigible 540 feet in length was kept moored to one of these masts for six weeks of more or less rough weather without receiving any injury.

As showing how reliable passenger service has become the *London Times* reports that Airco express airplanes, which fly daily between London and Paris, have completed the sixth week of continuous operation, having accomplished 83 out of a total of 86 flights without stoppage or breakdown. Furthermore, it is stated that only once during the 20,750 miles of flying has one of the pilots had to alight because of mechanical trouble. Toward the close of the year, reports reached us of the remarkable speed accomplished by Lecointe, the holder of French records, who covered a kilometer at a speed of 190 miles an hour.—*Scientific American*, Jan. 3, 1920.

## CURRENT NAVAL AND PROFESSIONAL PAPERS

Second Naval Prize Essay for 1918. *Journal of the Royal United Service Institution*, November, 1919.

The Confessions of Admirals. By Archibald Hurd. *The Fortnightly Review*, December, 1919.

U. S. Shipping Board's Annual Report. *United States Bulletin*, December 22, 1919.

Lord Fisher and the Navy of the Future. By Commander Pericles D. Rediadis, R. Hellenic Navy (retired). *The United Service Magazine*, December, 1919.

The United States Communication Service. By Captain S. W. Bryant, U. S. N. *Journal of the Franklin Institute*, December, 1919.

# NOTES ON INTERNATIONAL AFFAIRS

## FROM DECEMBER 15 TO JANUARY 15

PREPARED BY

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## PEACE TREATY GOES INTO EFFECT

RATIFICATION EXCHANGED.—At 4 p. m. on January 10 representatives of the fourteen powers who had ratified the Peace Treaty met at Versailles and by exchange of ratifications and signature of the protocol of Nov. 1 put the Treaty into effect. The thirteen Allied nations who had then ratified the Treaty were France, Great Britain, Italy, Japan, Belgium, Bolivia, Brazil, Guatemala, Peru, Poland, Siam, Czechoslovakia, and Uruguay. The United States not having ratified the Treaty, the State Department issued a notice that the conditions of the armistice still applied between Germany and the United States.

The ratification of the Treaty made possible immediate steps for execution of its terms, including the return of German prisoners of war, the meeting of boundary and other commissions, the holding of plebiscites in upper Silesia and other regions, and the resumption of diplomatic relation with Germany.

SETTLEMENT OF SCAPA FLOW DAMAGES.—The signing of the final protocol which held up execution of the Treaty was made possible by the written promise of the Allies to reduce the amount of material demanded in reparation for the sinking of German ships at Scapa Flow, provided Germany proved that the Allies' estimate of her floating materials was excessive. A note from the Supreme Council to Germany on December 23 insisted on the surrender of maritime equipment by Germany in payment for the fleet, but added that the Allies would take into account Germany's basic needs. It insisted further that the protocol should be signed at once, leaving details for later settlement.

UNITED STATES SENATE DELAYS ACCEPTANCE.—Following the putting into effect of the Treaty by other powers on January 10, efforts were increased by both Republican and Democratic Senators to reach a compromise resolution of ratification which would make possible the approval of the Treaty by the United States Senate and which would be accepted by the President. In a letter read at the Jackson Day dinner on January 8, President Wilson expressed his views on ratification as follows:

I have endeavored to make it plain that if the Senate wishes to say what the undoubted meaning of the League is I shall have no objection.

There can be no reasonable objection to interpretations accompanying the act of ratification itself. But when the Treaty is acted upon, I must know whether it means that we have ratified or rejected it.

We cannot rewrite this Treaty. We must take it without changes which alter its meaning, or leave it, and then after the rest of the world has signed it, we must face the unthinkable task of making another and separate treaty with Germany.

But no more mere assertions with regard to the wish and opinion of the country are credited. If there is any doubt as to what the people of the country think on this vital matter, the clear and single way out is to submit it for determination at the next election to the voters of the nation, to give the next election the form of a great and solemn referendum, a referendum as to the part the United States is to play in completing the settlements of the war and in the prevention in the future of such outrages as Germany attempted to perpetrate.

We have no more moral right to refuse now to take part in the execution and administration of these settlements than we had to refuse to take part in the fighting of the last few weeks of the war which brought victory and made it possible to dictate to Germany what the settlements should be. Our fidelity to our associates in the war is in question and the whole future of mankind. It will be heartening to the whole world to know the attitude and purpose of the people of the United States.

FRANCE DISSATISFIED WITH SHIPPING SETTLEMENT.—In a letter to Premier Clemenceau from the French Minister of Transport, published in December, dissatisfaction was expressed with the agreement of last May by which German ships were to be apportioned among the Allies according to the ratio of losses, Italy, it was stated, was to receive full compensation for all her ships lost, and France should demand the same, which would give her 910,000 tons instead of 250,000 tons on the basis of the agreement.

FIRST SESSION OF LEAGUE OF NATIONS COUNCIL.—On January 10, President Wilson, as provided by the Peace Treaty, issued notification of the first meeting of the Council of the League of Nations, to be held at Paris on January 16.

## AUSTRIA AND HUNGARY

TREATY TERMS RECEIVED BY HUNGARY.—On January 7 a Hungarian delegation headed by Count Apponyi and including 64 assistants arrived in Paris to receive the Hungarian Treaty. It was stated that the delivery of the terms would occur before the end of the following week.

AUSTRIA'S NEEDS.—At a meeting of the Supreme Council on December 17 it was decided that $70,000,000 in monthly installments of $9,500,000 would be required for relief of Austria. In testimony before a Congressional Committee in January 12, Mr. Herbert Hoover declared that an advance of $100,000,000 credits by the United States would be sufficient for European food supply until the next harvest. He stated further that if Austria were to be made a "perpetual poorhouse," contrary to the wishes of the United States, then the powers responsible should take in hand her relief.

## ITALY

SETTLEMENT OF FIUME QUESTION.—Discussion of the Adriatic question was renewed in Paris during the visit of the Italian Premier Nitti and Foreign Minister Scialovia for the exchange of ratifications, Nitti having promised not to return to Italy without a solution. The memorandum handed to Italy by France, Great Britain, and the United States at the London Conference in December was made public on January 8. It opened the way for further discussion, advocating complete Italian sovereignty over Avlona and its hinterland and the islands of Pelagossa, Lissa, and Tussin; an Italian mandate over Albania; Fiume to be a free city under the protection of the League of Nations; and no grant of territory to connect it with Italy.

PARIS, Jan. 13.—The announcement of an Adriatic agreement by the three Premiers is expected to-morrow or Thursday. It is understood that this plan will make a free city of Fiume, placing it on much the same footing as Danzig and will give to the Jugoslavs a strip running between Fiume and Trieste, the latter of which will be Italian.

It is understood further that it provides for the division of Adriatic Islands between Italy and Jugoslavia. In return for concessions Italy would get a mandate over Albania.

Minor geographical adjustments are now in progress, and in addition the Premiers are hearing the claims of the Greeks, who now desire to get some share in the Adriatic division.

The Jugoslavs are pleased this afternoon, and the Italians express disgust, saying that it seems that they are about "to be forced to accept the Jugoslav plan." They declare it will mean the fall of the Nitti Government, but that Italy will have to agree, to any settlement reached this week.—*N. Y. Times*, 14/1.

PROPOSED ALLIANCE WITH FRANCE AND BRITAIN.—Milan, Jan. 11.—According to a communication published here tonight an invitation to Italy to participate in the peace alliance with Great Britain and France suggests not only the conclusion of reciprocal military and naval agreements between the three countries in the event of armed aggression, but also a definite reshaping of Italian policy on lines affecting the common interests of the three great Western powers.

The acceptance of such a proposal would involve also a formal pledge from Italy that she will persevere steadfastly in her after-war political tendencies by more effective co-operation in the solution of national questions, colonial problems and economic difficulties.

## GREAT BRITAIN

PROSPOSALS FOR IRELAND.—In the House of Commons on December 22 Premier Lloyd George outlined the government's plan for Ireland, stating that two parliaments would be created, one for the North and one for the South. No coercion, he said, would be applied to Ulster to force her into union with the rest of Ireland.

SEIN FEIN VIOLENCE.—The motor car of Lord French, Viceroy of Ireland, was ambushed near Dublin on December 19, and attacked by a bomb and a fusilade of shots. None of the Viceroy's party was injured, but the bomb thrower was shot and captured.

On December 28 a second attack occurred on the guard of the Viceroyal Lodge in Dublin. The leader of the guard and one of the intruders were killed.

## RUSSIA AND BORDER STATES

TRUCE BETWEEN ESTHONIA AND RUSSIA.—On December 31 a preliminary armistice was signed at Dorpat between Esthonia and Soviet Russia stipulating immediate cessation of hostilities and negotiations for a preliminary peace. The terms recognized the full independence of Esthonia.

NEW EUROPEAN REPUBLICS.—The *Eastern Europe Review* gives the names and population figures of ten new Eastern republics as follows:

Esthonia—47,500 sq. kilometers, 1,750,000 inhabitants, 93 per cent Esthonians.

Latvia—64,196 sq. kilometers, 2,552,000 inhabitants, 72 per cent Letts.

Lithuania—125,000 sq. kilometers, 6,000,000 inhabitants.

White Russia—300,000 sq. kilometers, 14,075,000 inhabitants, 70 per cent White Russians.

Ukraine—800,000 sq. kilometers, 45,000,000 inhabitants, 72 per cent Ukrainians.

Kouban—85,000 sq. miles, 3,500,000 inhabitants.

North Caucasia—150,000 sq. kilometers, 4,300,000 inhabitants.

Azerbaidjan—100,000 sq. kilometers, 4,500,000 inhabitants, 75 per cent Turko-Tartars.

Georgia—90,000 sq. kilometers, 3,000,000 inhabitants, 75 per cent Georgians.

Armenia—320,000 sq. kilometers, 4,000,000 inhabitants, 75 per cent Armenians.—*Times Current History*, January.

POLAND'S NEW MINISTRY.—The new premier of Poland, M. Skulski, following the resignation of the Paderewski Cabinet, formed a coalition ministry supported by the Peasant and other parties except the extreme Socialists. In a statement to the press on December 28, the new Foreign Minister, M. Patek, declared that he knew for a certainty that the Bolshevike would open a big offensive against Poland in the spring. M. Patek was then in Paris to seek financial aid for the support of the Polish military forces.

## FAR EAST

AMERICAN FORCES TO QUIT SIBERIA.—On January 12 it was announced by Secretary Lansing that all American troops would be withdrawn from Siberia by the middle of March, or as soon as the removal of the Czechoslovak contingents and the Stevens Railway Mission could be accomplished. The United States was requested by Czechoslovakia to undertake the transport of 32,000 of the 50,000 Czechs in Siberia, and Great Britain the remainder, which include some Poles, Jugoslavs, and Rumanians. These will be taken to Trieste via either Suez or Panama. There are approximately 9000 American regulars now in Siberia.

JAPAN TO OPPOSE REDS IN SIBERIA.—In a statement to the press on December 23 Premier Kei Hara of Japan declared that "While Japan hopes to harmonize her military action in Siberia with that of America and to square it with the general anti-Bolshevist policy, under no cir-

cumstances can she permit the Red influence, as long as it remains dangerous, to touch her borders." This was taken as indicating Japan's fixed determination to fight the Reds in Siberia. "Japan," the Premier further declared, "has absolutely no territorial ambitions in Siberia, will not take a square foot of territory, and the minute the Red menace is settled will withdraw every soldier." The Premier also stated that "The minute peace is signed Japan will take up the matter of a full return of all territory in China. Japan absolutely pledges to give up all territory and to take out all her troops. She will retain only her purely commercial interests and concessions which belonged to Germany."

RENEWAL OF ANGLO-JAPANESE ALLIANCE IN DOUBT.—Renewal of the Anglo-Japanese Alliance, which expires next year, is now under discussion in Japan. It is pointed out that conditions have changed by the weakening of Germany, and that Great Britain can now maintain an ample naval force to protect her interests in the Pacific. Continuation of the alliance is nevertheless strongly advocated.

JAPAN'S CHINESE POLICY.—(Extracts from article by Putnam Weal in January *Current History.*)

Given a true open door and true equal opportunity, the Japanese know that three things must infallibly occur in China before many years have passed: First, that Western nations will supply capital and equipment at a far more rapid speed than Japan can do, and therefore will outstrip her; secondly, that the effect of this will be that in open competition, with their superior banking and industrial facilities and their abundant supplies of raw materials, Western nations will command the market with better and, relatively speaking, cheaper goods; third, and most important, that the Chinese, being apt pupils and good workers by hand and by machine, and very excellent accumulators of wealth, will in the end acquire by purchase all established Western interests, the net effect at the end of the present generation—say by 1940—being that China, with her teeming population, which is now increasing at the rate of 38,000,000 every decennium, will be the dominating power in Eastern Asia—commercially, economically, politically.

This is the secret of Korea, Manchuria, and Shantung. The whole policy of Japan since 1905 and the Russian war has been a last desperate mistaken attempt to be saved, as she thinks, from being cast back into the sea by climbing on China's back and holding on there like grim death. Every move made by her during the world war to prevent China from participating in the struggle has been dictated by this policy; for that Japan is destined to fall back in the international race and resume the position she occupied prior to 1894 is certain unless there are great revolutionary changes in her constitutional structure and a complete destruction of her militarism.

There is a last point, which has some significance—the implication that since Japan is excluded from directing her emigration to the white man's lands she must have a *quid pro quo.*

This statement is as misleading as the rest, for the assumption is that her population must overflow in some direction. The plain fact is that in fifteen years she has sent less than 350,000 emigrants to Korea and that in other eastern regions, notably Formosa, Japanese appear to be actually decreasing. Why is this? Because it is the presence of the white man, the development work he has put in, and the great markets and high wages in his countries, which are attractive to the Japanese—not the land

as land. That is to say, if California and Australia were to-day totally uninhabited, no Japanese of any sort would ever think of going to them. It is the white man and his wealth that form the attraction. This magnet has nothing to do with the over-spill of Japanese population, which is still far less dense than in many industrialized regions of Europe. That the Japanese as a man is congenitally disinclined to go abroad is proved by the embittering experience of the colonization companies in Brazil and other South American countries.

Finally, China is changing, not fast but slow and surely. Her commerce and industries are creeping up; her education is improving; the student classes are influencing public opinion more and more; her communications are on the eve of a vast development. This year her commerce will exceed $2,000,000,000 for the first time in her history. She has now fifty complete cotton mills on order, and when these are added to the seventy already working a chain of mills from Tientsin to Shanghai will be throbbing with life, and the cotton industry will be well established in the cotton-growing areas.

China's political reorganization depends upon her industrial awakening; it is the growth of the coal and iron trade, now commencing on a heavy scale, and the building of railways and hard-surface roads which will insure her stability and her peace, much more than making of paper constitutions or agreements between political leaders. It has been industrial backwardness, the absence of modern communications, and the non-development of a modern credit system coupled with the double-dealing of Japan which have led to "civil wars"—really armed provincial rioting.

## TURKEY

TURKEY MAY STAY IN CONSTANTINOPLE.—Paris, Jan. 12.—It has been already decided that the Turks will be left in Constantinople, probably with full sovereignty, but after important concessions have been made in the way of administrative reforms, according to the opinion of persons in close touch with the conference now in session here.

Premiers Clemenceau, Lloyd George, and Nitti met again to-day in continuance of their conference on both the Adriatic and Turkish questions, and the letter is supposed to have been uppermost in their deliberations of this morning.

The situation in the Mussulman world has been strongly represented as requiring moderation in dealing with Oriental questions. One result appears to have been a curious shifting of positions by France and Great Britain. The French originally were represented as desiring to maintain the Turks in Constantinople, but afterward came around to the British view in favor of their complete expulsion. As the result of representations by Edwin S. Montagu, the Secretary for India, however, the British are said in turn to have shifted their position and now hold the view originally taken by the French.

Greece, while preferring to see the Turks entirely ousted from Europe, appears to be concentrating her efforts to secure Eastern Thrace as far as the Enos-Midia line.—*N. Y. Times,* 13/1.

## MEXICO

MEXICO'S LAST NOTE IN JENKINS CASE.—Another Mexican note on the Jenkins case was submitted on December 16, ending as follows:

"The Mexican Government cannot admit that American citizens can be judged and set free on simple information of the Department of State nor recommendations or suggestions of the United States instead of being tried by its courts conforming to Mexican laws.

"Now that Jenkins has been freed by the Judge of the State of Puebla the case is being studied in the highest court of the Republic to decide which judge is competent to try the case. The Government of Mexico expects that the case will not disturb the harmony which it sincerely desires to exist, between Mexico and the United States."

MEXICAN ELECTIONS.—In the presidential campaigns in Mexico President Carranza has given his support to Señor Bonillas, the Mexican Ambassador to the United States, who stands on a liberal platform advocating "the development of the resources and wealth of the country in conformity with the ideas and the ideals of the Carranza revolution." Upon President Carranza's refusal to accept General Abregon's resignation from the army in order to become a candidate, the latter threatened insurrection.

REPORT OF ARMS FROM JAPAN.—On January 12 a despatch from San Antonio stated that Washington officials had received a report of the arrival of a Japanese vessel at Manzanillo, on the Pacific coast, with a cargo of arms and munition for Mexico. The vessel, it was stated, was accompanied by the Japanese cruiser *Yakimo*, whose officers were later received in Mexico City. The arms are said to have been purchased in Japan by Col. Emilio Cirolos and Manuel Romero, formerly Mexican Minister at Tokio. U. S. War Department officials confirmed the imputation of munitions, but stated that the visit of the cruiser was not connected with it.

# REVIEW OF BOOKS
## ON
## SUBJECTS OF PROFESSIONAL INTEREST

"Riots and Riot Duty." By Edward S. Farrow, Late Instructor of Tactics at the United States Military Academy. 44 pages. Price 50c. (Published by the Military-Naval Book Corporation, Asbury Park, N. J.)

Let the American naval officer ask himself these questions: Do I know the limitations of my authority when forces under my command are called upon to assist the police in quelling civil riots? Do I know enough of mob psychology to gage the temper of the riotous crowd so that I can better control any situation that may arise? Do I know the legal decisions rendered and the precedents established bearing upon the responsibility of a commander of troops when the forces under his command kill or maim a civilian in their attempt to restore order in a disturbed district? Do I know the basic rules which should govern the employment of United States troops engaged in restoring order at the request of the state and municipal authorities? Can I describe with accuracy and precision the rules of conduct which govern an armed sentry on post or an armed squad patrolling a disturbed district particularly as applies to their *legal responsibility* for deaths caused in the so-called performance of duty?

If these questions can be answered affirmatively, the manual on Riots and Riot Duty will have little interest for the reader. To others, however, the information so adequately given by Mr. Farrow will be of the utmost importance, especially to the officer who appreciates his responsibilities to his country in times of unrest and civil disturbances. The pamphlet gives in detail a description of a number of useful riot formations known as the *wedge, diagonal* and *deployed line* which can be used to advantage when operating against organized or unorganized mobs.

The location of our navy yards and other naval establishments in the center of great industrial regions renders officers and men in the naval service especially liable to riot duty in disturbed localities when the police are unable to cope with the situation. The officer who knows what to do and when to do it, who knows the extent and limitations of his authority, goes doubly armed as well as doubly protected in the performance of a duty which is perhaps the most delicate, and is certainly the most distasteful, to which an American officer is likely to be assigned.

J. M.

"Farrow's Manual of Military Training." By Edward S. Farrow, Late Assistant Instructor of Tactics, United States Military Academy. Printed on India paper and bound in red leather. 1034 pages. Price $4.00 net. (Published by the Scientific American Publishing Co., New York.)

A hand-book written for officers in the military service.

This well-written and admirably arranged volume can be best described as a "military Trautwine." It is difficult to conceive of a book better suited

to its purpose than this one. It undoubtedly will meet with an instant and well-deserved success. The need of such work has long been felt.

To the naval officer the manual will prove not only interesting but valuable. The day has long since passed when officers of the navy can afford to ignore, or rather, remain ignorant of the rules of administration, the tactics and the methods employed by the military branches of the armed forces of the United States when training troops for active service in the field. The rules governing the employment of infantry, artillery, machine guns, etc., are simple and should be understood by every officer. In his manual, Mr. Farrow has included descriptions of every phase of modern warfare, together with complete instructions for the training and care of troops in the field.

The officer of the navy serving with troops ashore may secure for his guidance much pertinent information, especially in the sections on "Camps, Cantonments, Camp Sanitation and the Sheltering of Troops"; "Interior Guard Duty"; "Guards and Military Police"; "Ceremonies, Inspections, Honors and Courtesies"; "Marches and March Discipline"; and other parts devoted to infantry training. The value of the manual not only lies in its voluminous contents, but in the well-arranged index which enables the reader to find information quickly. In order to make a real hand-book, the author includes the Army Drill Regulations, the regulations governing Small Arms Target Practice, Physical Training, Manual of the Bayonet, Personal Hygiene and First Aid, Signals and Radio Telegraphy, Map Reading and Sketching, Gymnastics, The Rules of Land Warfare, and Gunnery and Explosives. To one interested in tactics, valuable sections are "Liaison"; "Basic Principles of Combat Tactics"; "Offensive and Defensive Combat"; "Toxic Gases" and "Trench Warfare, Trench Raids and the Service of the Trenches." It must be remembered that this work has been prepared in the light of the experience of the past five years, and it includes all of the latest information secured in the world war.

The attention of the marine corps and marine officers in general is especially invited to this book.

Only by confining himself to "meaty facts" has the author been able to cover such a wide field in one relatively small volume. The style is noteworthy for its clearness, precision and terseness. The American military officer is fortunate in having at hand such a useful publication which is small enough to be carried in a coat pocket and which gives him an immediate reference book for nearly any problem which may arise, either in garrison or in the field.

J. M.

"The Outlook for Research and Invention, with an Appendix of Problems Awaiting Solution." By Nevil Monroe Hopkins, M. Sc., Ph. D. (D. Van Nostrand Company, New York, 1919.)

The world war was "one of the chemists," and, as conditions become settled and new adjustments gain some permanency, "peace will likewise be one of chemists." This observation, which the author credits to Sir

Joseph Lamar, suggests a new point of view from which we may study the results of the great conflict.

"America has never been a nation of research in the profound scientific sense, but rather one of superficial invention." While Professor Hopkins does not make this statement on his own authority, he reverts to it often and does not hesitate—for the good of the country—to show how certain European nations have in the past followed much sounder scientific methods. They have made better provision for advanced study and research in their universities; they have in their factories shown a friendliness to the expert chemist or engineer, unknown in America where the expert is often the victim of animosity caused by the fear that he may introduce some revolutionary idea; they have painstakingly organized their resources in universities and manufacturing plants so that they may contribute to the power and progress of the state.

The war caused in America a great awakening. Professors, as well as students, and large manufacturing corporations, as well as laborers, said, "Use me." And the result was the organizing of our intellectual as well as our physical resources as never before. Before hostilities had ended, it was seen that the door had opened to large opportunities. Will America "profit by her powerful strategic position, and develop her full possibilities as the horrors of the great war fade into gray ghosts of the past"

This the author believes can be done, not by a protective tariff or a trade boycott, but by improving the method and quality of production. And it must be the trained scientists, constantly studying the problems, that shall show the way. The country, impressed by the war experience, as a whole realizes this as never before, and is inclined to make some of the necessary provisions. The author, who is an electrical engineer and inventor of distinction, seeks in the little book to do his part in increasing the efficiency of research by showing "its charm, its national worth at this time," and "the educational requirements to those new in the field." And he would similarly be of assistance to inventors by "pointing out the reasons for loss in efficiency through misconceptions, intense duplication work, and the many snares and pitfalls awaiting the unwary inventor."

He writes in a frank, personal style, and one of the most interesting parts of the book for the general reader is his statement of how the National Research Council came into existence and how he was connected with it. He was nominated by George Washington University, and served as technical adviser in the Bureau of Ordnance with rank as major. We could wish his experiences here had been given with some fullness. But such a chapter of the history of the war has yet to be written. He summarizes the problems he dealt with, "as a broad range from 'Submarine Protection and Submarine Defense' for the Ship Protection Committee of the Emergency Fleet, to the 'Electrical Fixation of Nitrogen,' and in the making of new high explosives for the War Department." Of apparatus, methods and results, he says nothing. Earlier in his career Professor Hopkins was an electrician in the General Electric Company, and thus must have at hand fullest information what that company, the American Telephone and Telegraph Company, and other large corparations have

provided in respect to laboratories for research. But though he strongly asserts the financial returns from well-directed research, he does not back up his argument, as we believe he might, in a convincing way by showing what some of the large companies have gained by the sums mounting into millions invested this way.

From 1905 to 1908 Professor Hopkins was electrical engineer for the Navy Department in charge of power plant design and construction at all navy yards and stations. Being in Europe at the beginning of the war, first in Germany, later with the French Army during its retreat from Mons, he saw something of the horribleness of Germany, and he came home to lecture on preparedness. The present highly stimulating book is but a continuation of his service during the war. He says, "We have expanded from internal and local modes of thinking and acting into international methods of thought and action." He points out several hundred of the great scientific problems awaiting solution, and gives wholesome advice as to the sane logical method of grappling with them.

C. S. A.

"Governors and the Governing of Prime Movers." By W. Trinks, M. E., Professor of Mech. Eng., Carnegie Institute of Technology. 218 pages, 140 illustrations. (D. Van Nostrand Co., New York.)

In this book the subject is taken up from the theoretical point of view and the theory of design and operation of governors developed along general lines. The scope of the work is not limited to any particular type or make of governor but it is a comprehensive treatise of the various types in general use.

The method of presentation is excellent and should appeal to the beginner as well as to the advanced student of the subject.

A very useful chapter on governor troubles and their remedies greatly adds to the value of the book for the operating engineer who believes that he should know the "reason why."

Centrifugal governors, shaft governors, rate of flow governors, pressure governors and relay governors are taken up in order and the methods of determining the regulating force and time required to accomplish the regulation are developed for each type.

F. V. V.

"Applied Calculus." By Robert Gibbes Thomas.

The title of this book led the reviewer to expect a work on the applications of the calculus entirely beyond those given in the text books written for first courses in calculus. The book, however, is simply a text for a first course in the subject, the applications not being much more advanced or greater in number than those found in some other books of the same type.

The author himself states in the preface "The book as a first course in the calculus is not designed to be a complete exposition of the calculus in either its principles or its applications. It is an effort to make clear the basic principles and to show that fundamental ideas are involved in familiar problems."

As a first course in calculus from the teacher's viewpoint the book has many good features and some that would seem to detract seriously from its usefulness.

In its treatment of differential calculus the *differential* is defined as a finite quantity before defining derivative and the formulas for differentiation are given in the differential form. In fact differentiation is defined as the operation of finding the differential of the function in terms of the differential of the argument. In deriving these formulas, in some cases more than one method of derivation is given, in some the derivative and method of limits being used.

In the integral calculus a list of 22 elementary "Standard Formulas" is given but the explanation of methods of using them is extremely brief and no further table of integrals is given. The applications to areas, lengths, volumes, centers of gravity, etc., seem to be well covered and the book closes with a chapter devoted to a very brief treatment of differential equations with some applications to mechanics and central forces.

C. L. L.

"Induction Coils in Theory and Practice." By Prof. F. E. Austin, E. E. Price $1.00. 64 pages, 45 figures.

This little book will be found of value to the amateur experimenters in electricity and wireless. Those who are particularly interested in induction coil design will not find an answer to the question, how design a coil for any specifications, but will find detailed specifications for the building of a 39-inch, a 10-inch, a 6-inch, a 3-inch, and a 0.5-inch coil.

The preface of this book should be materially altered to correspond with the body of the book and some of the sweeping statements as "The induction coil is one of the most important electrical devices of the present time," "The induction coil renders the operation of the gasoline-driven automobile possible" should be toned down. In section 195 the author modifies this last statement to read, "The so-called 'spark-coil' is employed . . . . in *some* types of gas engine ignition." The preface leads one to expect to find in the book much relating to wireless telegraphy, whereas but two pages are devoted specifically to radio.

On page 5 the author says that "The induction coil or transformer is the vital part of all wireless outfits." This statement must be considerably modified in the light of present practice. The author fails to emphasize the fact that the ordinary commercial tranformer is susceptible of accurate design while the design of an induction coil is largely empirical, involving as it does a wide open magnetic circuit.

Summing up, it may be said that this book is a brief set of notes, elementary in character, dealing with the induction coil and its uses.

L. A. D.